New Hampshire Climate Change Policy Task Force
Draft Action Reports under Development

Residential, Commercial and Industrial (RCI)
Working Group

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Residential, Commercial and Industrial (RCI)

RCI Action 1.1 – Maximize Energy Efficiency in New Construction

Summary

Energy efficiency should be maximized and net CO_2 output should be minimized in new residential, commercial, institutional, and industrial building construction**.** To the extent economically feasible, new construction should meet these objectives by incorporating state-of-the art energy efficiency and renewable energy systems into the design of the building envelope, operating systems (HVAC in particular), and energy consuming appliances and devices.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* The objectives of high energy efficiency and low CO_2 emissions are to be achieved through a combination of
    - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
    - Graduated financial incentives for above-code performance; and
    - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* Legislation for building codes, zoning regulations, and potential tax code incentives. PUC actions in program development, incentives, state outreach, and education. Potential funding sources include: System Benefits Charge, Forward Capacity Market, Renewable Energy Fund, and GHG Reduction Fund.
    b. *Resources Required:* Funding for outreach, education, training, financial incentives for above code performance, and capitalization and/or credit enhancement for revolving loan and energy efficient mortgage programs.
    c. *Barriers to Address (especially for medium to low feasibility actions):*
        i. Infrastructure – There is a challenge in capturing, maintaining and disseminating knowledge and skills for state-of-the-art best practices, especially as that is a moving target crossing many building science and related disciplines. There may be issues with regard to capacity in both state government staff and the private sector with a need for skilled workforce development.
        ii. Higher First Cost – Premium efficiency equipment and measures generally commands a higher first cost.
        iii. Lack of Information/Unfamiliar Technologies/Product Availability – A problem attendant to all new technologies is an information and experience gap as compared to the comparable "tried and true" product equivalent. This can lead to reluctance on the part of designers, builders, and end-users to adopt the high efficiency alternatives. Furthermore, there can be problems with product availability and lead times.
        iv. Owner vs. Occupant Issues – Facility owners who do not pay the operating expenses may be reluctant to install premium efficiency equipment. Similarly, occupants who do not own a facility will be reluctant to make capital upgrades in order to achieve efficiency improvements.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):
    a. *Parties Responsible for Implementation:* State and local government, NGOs, utilities, businesses, professional and trade associations, building owners, developers, managers, operators, architects, engineers, contractors and trades people.

b. *Parties Paying for Implementation:* Current ratepayers through utilities (SBC, RPS, RGGI), investors, lenders, and building owners.

c. *Parties Benefiting from Implementation:* Builders, building owners, tenants, and occupants, ratepayers, and the entire State of New Hampshire.

4. Related Existing Policies and Programs: CORE program (e.g. Energy Star New Homes Program and High Performance new commercial construction), Federal Tax credits, High Performance Schools (Jordan Institute & State), LEED (U.S. Green Buildings Council), EPA Energy Star programs including appliances, equipment and commercial building benchmarking, BOMA Energy Efficiency Program (BEEP), AIA & ASHRAE programs, local energy committees.

5. Complementary Policies (i.e., those that achieve greater reductions through parallel implementation):

   a. *Existing:* See above plus building and appliance energy codes, including raising standards and compliance.

   b. *Proposed:* EGU Actions 1.1, Revenue Decoupling; 1.2, Energy Efficiency Procurement; 1.3, Combined Heat & Power Resource Standard; AFW Action 1.3, Promote Durable Wood Products; and TLU Actions, particularly those related to Goal 2.C.

6. Timeframe for Implementation:

   The CORE Programs have budgeted $5 million for new construction in 2008. With additional funding, there are opportunities for substantial program ramp up starting later this year and likely continuing for several years. By way of background, in 2006 New Hampshire ranked 4th in the nation in the portion of new homes that were Energy Star qualified at 17%, but lagging behind the leaders (New Jersey at 31%, VT at 24% and CT at 23%). One utility service territory in Vermont has approached 100%. 100% Energy Star qualified new construction will take some time and near zero net energy new construction, which is approaching technical feasibility, is an even further reach.

7. Anticipated Timeframe of Outcome: Starting in the near term, increasing over time and sustaining far into the future.

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
30% More Efficient	Direct Fuel Use	0.09	0.39	0.95
	Electricity	0.11	0.47	1.13
	Total	0.20	0.86	2.08
70% More Efficient	Direct Fuel Use	0.15	0.91	2.21
	Electricity	0.21	1.09	2.64
	Total	0.36	2.00	4.85
100% More Efficient	Direct Fuel Use	0.18	1.30	3.16
	Electricity	0.28	1.55	3.78
	Total	0.46	2.85	6.93

2. Economic Effects:

    a. Costs:

        i. Implementation Cost:

Efficiency Improvement	Relative Cost
30% More Efficient	Moderate
70% More Efficient	Moderately High
100% More Efficient	Very High

        ii. Timing: Constant/even for all scenarios
        iii. Impacts: Evenly distributed for all scenarios

    b. Savings:

        i. Potential Economic Benefits:

Efficiency Improvement	Relative Cost
30% More Efficient	Moderate
70% More Efficient	Moderately High
100% More Efficient	Very High

        ii. Timing: Low short-term / mostly long-term for all scenarios
        iii. Impacts: Evenly distributed for all scenarios

3. Other Benefits/Impacts:

    a. *Environmental*: This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health*: Personal comfort and air quality in building could be improved or indoor air quality can decline with tight construction if not implemented correctly with appropriate ventilation and air exchange.

    c. *Social:* Reducing energy use typically have short-term payback periods and can then provide savings for consumers and economic security for the state in the mid to long-term.

    d. *Other:*

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

    a. *Technical:* There are knowledge and skill barriers to state of the art practices such as lack of technical resources and expertise. Capacity for skilled workforce development to implement high performance best practices in new construction will be a challenge.

    b. *Economic*: In new construction, most EE measures and many renewable energy systems can be incorporated at life-cycle costs that will pay for themselves within the life of the measures, so there is the potential for substantial cost savings over time. There are significant market barriers in that much new construction is not minimizing life-cycle costs. Sometimes the developer is more interested in minimizing up front costs, such as for the sale of homes, or rental property, where the user or purchaser will pay the operating costs.

    c. *Statutory/Regulatory*: Demise of federal Energy Tax credit[1].

[1] In December, 2007, legislation to extend several of the Energy Efficiency Tax Incentives fell one vote short of the 60 required to end a filibuster in the Senate. Some incentives were extended through 2008 by the 109th Congress, in December 2006. As of

d. *Social*: The most important factor in new home buyers' decisions to buy or build their home rather than any other home may be the quality of construction. Energy Star homes may not be able to claim outright that a home with the label is better constructed than one without it, although it is likely to use significantly less energy. Price is also a factor and Energy Start homes will tend to have a higher up front cost.
The reasons builders gave during interviews for not marketing energy efficiency included: 1) home buyers don't care; 2) home buyers are not educated about it and not interested in it; 3) they don't see any real need to push it since there is no energy crisis, 4) They don't think it makes any sense to do – customers are not willing to pay the extra cost and many don't want to get out of the realm of standard.

5. Other Factors of Note: Additional data sources may include EPRI EE potential study, NHPUC EE potential study (though not ready until August), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, and ACEEE.

6. Level of Group Interest: High

7. References:

December 31, 2007, however, the majority of the energy efficiency incentives provided under the Energy Policy Act of 2005 have expired.

RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings

Summary

Retrofit existing New Hampshire housing stock to minimize or eliminate net CO_2e output, and further, to ensure that current and future investments minimize embedded CO_2e output. To the extent economically feasible, program elements should include: 1) building shell and fenestration upgrades, including instrumented air sealing and thermographic inspections; 2) space conditioning equipment upgrades/replacements, including ductwork and duct sealing; 3) domestic hot water system upgrades; 4) ENERGY STAR lighting; 5) water saving measures; 6) ENERGY STAR appliances; and 7) use of renewable energy systems. Any replaced equipment would be permanently removed from service.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* CO_2e reductions achieved through reduced energy usage and displacement of existing energy sources with cost-effective renewables. Vehicles for implementation include:
   - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
   - Graduated financial incentives for above-code performance; and
   - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
   a. *Method of Establishment (e.g., legislation, executive order):* As part of the Restructuring Act, RSA 374-F:3 X, electric utilities in the State of New Hampshire have established a set of energy efficiency programs designed for statewide implementation in the service territories of the utilities regulated by the Public Utilities Commission (PUC). On January 1, 2003, the natural gas utilities again began offering energy efficiency programs for New Hampshire customers. In addition, there may be funds available via the Renewable Portfolio Standard (if alternative compliance payments are made), the Regional Greenhouse Gas Initiative, and possibly via SB 1628 (legislation that would provide residential customers a financial incentive for installing qualifying renewable generation).
   b. *Resources Required:* Energy service companies serving residential customers (single family and multi-family buildings) would help identify opportunities and implement appropriate energy efficiency or renewable energy opportunities. Other resources who would assist with or affect retrofit work are building owners or occupants, facility managers, retail lighting, appliance and home improvement stores, etc. Electric and Gas utilities have program implementation staff already in the field working with customers. Revolving loan funds and energy efficient mortgage products might help finance cost-effective measures over some or all of the measure life with neutral or positive net cash flow to the owner.
   c. *Barriers to Address (especially for medium to low feasibility actions):* Having skilled energy auditors or energy service companies who can help make good recommendations for home improvement opportunities and/or cost-effective renewable energy additions. Other barriers include: 1) high first cost of energy efficiency or renewable energy measures; 2) lack of consumer awareness of efficient appliances, lighting, and building technology, and acceptance of these; 3) split incentives, i.e., no incentive for tenant to improve landlord's property and no incentive for landlord to invest if tenant pays utility bill; 4) inability to recognize efficiency measures; 5) lack of retailer/manufacturer interest and marketing support for efficient products; 6) lack of builder/contractor interest and support for energy efficient lighting; and, probably most important, 7) the potential lack of consumer financial resources to implement recommended energy efficiency/renewable energy improvements.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.)

a. *Parties Responsible for Implementation:* NH utilities and building owners and rental property managers.

b. *Parties Paying for Implementation:* NH electric and gas customers (ratepayers) and building owners.

c. *Parties Benefiting from Implementation:* Anyone living in an existing NH residence. NH landlords and property managers.

4. Related Existing Policies and Programs: CORE Energy Efficiency Programs (Energy Star Lighting, Appliances, Home Energy Assistance, Home Energy Solutions all address residential customers), Gas company efficiency programs, federal tax credits, EPA Energy Star programs and equipment ratings. Note that Renewable Portfolio Standards, Regional Greenhouse Gas Initiative, and SB1628 (legislation providing incentives for renewable generation) will generate additional funding for specific technology improvements.

5. Complementary Policies: *(i.e., those that achieve greater reductions through parallel implementation)*

   a. *Existing:* Electric and natural gas utilities have programs in place funded through utility bill surcharges. The Community Action Agencies have programs for income eligible customers funded through a combination of federal funds and utility bill surcharges.

   b. *Proposed:* Residential Energy Demand Reduction; RCI Action 1.5, Establish an Energy Properties Section in MLS Listings; RCI Action 3.1, Promote Renewable Energy and Low-CO_2e Thermal Energy Systems; Action 4.2, Increase Energy Efficiency through Building Management Education Programs; and Action 4.4, Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program. Integrating renewable energy additions and/or CO_2 reduction strategies into existing weatherization programs.

6. Timeframe of Implementation: There are approximately 600,000 housing units in the state. It is likely to take a decade or more to complete this work.

7. Anticipated Timeframe of Outcome: CO_2e reductions would begin to accrue immediately as each residence is retrofitted.

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
30,000 homes/year; 15% more efficient	Direct fuel use	0.11	0.48	0.48
	Electricity	0.08	0.34	0.34
	Total	0.19	0.82	0.82
30,000 homes/year; 30% more efficient	Direct fuel use	0.23	0.95	0.95
	Electricity	0.16	0.69	0.69
	Total	0.39	1.64	1.64
30,000 homes/year; 60% more efficient	Direct fuel use	0.45	1.91	1.91
	Electricity	0.33	1.38	1.38
	Total	0.78	3.29	3.29
15,000 homes/year; 15% more efficient	Direct fuel use	0.06	0.24	0.48
	Electricity	0.04	0.17	0.34
	Total	0.10	0.41	0.82
15,000 homes/year; 30% more efficient	Direct fuel use	0.11	0.48	0.95
	Electricity	0.08	0.35	0.69
	Total	0.19	0.83	1.64
15,000 homes/year; 60% more efficient	Direct fuel use	0.23	0.96	1.91
	Electricity	0.16	0.69	1.38
	Total	0.39	1.65	3.29

2. Economic Effects

   a. Costs:

      i. Implementation Cost:

Efficiency Improvement	Relative Cost
30,000 homes/year; 15% more efficient	Moderate
30,000 homes/year; 30% more efficient	Moderately High
30,000 homes/year; 60% more efficient	Very High
15,000 homes/year; 15% more efficient	Moderate
15,000 homes/year; 30% more efficient	Moderately High
15,000 homes/year; 60% more efficient	High

      ii. Timing: Immediate / higher upfront for all scenarios
      iii. Impacts: Consumer – evenly distributed for all scenarios

   b. Savings:

      i. Potential Economic Benefits:

Efficiency Improvement	Relative Benefit
30,000 homes/year; 15% more efficient	Moderately high
30,000 homes/year; 30% more efficient	High
30,000 homes/year; 60% more efficient	Very High
15,000 homes/year; 15% more efficient	Moderately High
15,000 homes/year; 30% more efficient	Moderately High
15,000 homes/year; 60% more efficient	High

      ii. Timing: Low short-term / mostly long-term for all scenarios
      iii. Impacts: Consumer – evenly distributed for all scenarios

3. Other Benefits/Impacts:

   a. *Environmental:* Other emissions from electric generation and burning of fossil fuels for thermal loads will be reduced. Potential benefits beyond CO_2e reductions include: water savings, reduced sewage, and peak demand savings.

   b. *Health:* Personal comfort, air quality and the safety of occupants could be improved or indoor air quality can decline with air sealing and airtight retrofit if not implemented correctly with appropriate ventilation and air exchange.

   c. *Social:* Reducing energy use typically have short-term payback periods and can then provide savings for consumers and economic security for the state in the mid to long-term.

   d. *Other:*

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

   a. *Technical:* There are several programs to improve efficiency of existing residential housing stock in place today. Current programs provide weatherization services to approximately 2,000 housing units annually. This number will have to be significantly increased in order to accommodate all 600,000 NH residences…many more service providers will be needed.

   b. *Economic:* Based on benefit/cost models currently used to evaluate NH efficiency programs, it is possible that many of the suggested retrofit measures would likely not be cost-effective. Most energy efficiency program funding models are based on a cost sharing arrangement whereby public funds are used to attract private investment as a means of funding each project. This model attempts to maximize the impact of public funds by requiring a significant private investment in each project. To the extent

public funding for a project is reduced, more private investment will be required. While this will improve the cost-effectiveness of the public funds, fewer participants will be able to afford being involved in the program. To the extent public funding of a project is increased, overall available funding will be lower and fewer projects can be completed. Finding the right balance that will achieve the goal of retrofitting all 600,000 NH homes while treating all participants equitably is likely to be a challenge. Attractive and convenient financing alternatives such as energy efficient mortgages may provide another means for funding extensive retrofits.

c. *Statutory/Regulatory*: Continued SBC funding, availability of RPS or RGGI funds. In addition the NH Public Utilities Commission is currently examining the issue of decoupling utility revenues from sales volume. Decoupling is intended to remove a potential barrier to a utility taking action to reduce sales and therefore revenues.

d. *Social:* The methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

5. Other Factors of Note:

   Additional data sources may include EPRI EE potential study, NHPUC EE potential study (ECD: August 2008), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, CEE and ACEEE.

   Properly installed solar photovoltaic can produce approximately 1,200 kWh/year (per kW); wind is harder to estimate due to the variability of the wind at each specific location.

6. Level of Group Interest: High

7. References:

- US Census Fact Finder Website, http://factfinder.census.gov/home/saff/main.html?_lang=en.
- Affordable Comfort, Inc. (ACI) white paper "Moving Existing Homes Toward Carbon Neutrality," http://www.affordablecomfort.org/PDF/Summit_White_Paper_11-28-07_Review_Draft.pdf.

RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings

Summary

Retrofit existing New Hampshire commercial, industrial, and municipal buildings to minimize or eliminate net CO_2e output, and further, to ensure that current and future investments minimize embedded CO_2e output. To the extent economically feasible, program elements should include the following: 1) lighting; 2) heating, ventilating and air conditioning (HVAC) system upgrades/replacements; 3) processes (air compressor equipment, air leak reduction, motors, VFDs, injection molding equipment, etc.); 4) control equipment and technologies to ensure lighting, HVAC, business equipment (copy machines, computers, motors, etc.) and other equipment is operating optimally to save energy and to reduce demand; 5) refrigeration equipment (grocery stores, supermarkets, gas station/convenience stores, restaurants, etc.); 6) building shell and fenestration upgrades; 7) hot water system upgrades; 8) reduced water usage; and 9) use of renewable energy systems. Any replaced equipment would be permanently removed from service.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* CO_2e reductions would be achieved though reduced energy usage and/or displacement of existing energy sources with cost-effective renewables. Vehicles for implementation include:
   - Outreach, marketing, education and training to building owners, developers, managers, operators, architects, engineers, contractors and trades people;
   - Graduated financial incentives for above-code performance; and
   - Access to attractive financing to amortize the costs of extra energy efficiency measures and renewable energy / low-emission systems over their life times.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
   a. *Method of Establishment (e.g., legislation, executive order):* As part of the Restructuring Act, RSA 374-F:3 X, the electric utilities in the State of New Hampshire have established a set of energy efficiency programs designed for statewide implementation in the service territories of the utilities regulated by the Public Utilities Commission (PUC). On January 1, 2003, the natural gas utilities again began offering energy efficiency programs for New Hampshire customers. In addition, there may be funds available via the Forward Capacity Market, Renewable Portfolio Standard (if alternative compliance payments are made) and possibly via the Regional Greenhouse Gas Initiative.
   b. *Resources Required:* Energy Service Companies serving commercial and industrial customers will help customer identify opportunities and implement appropriate equipment. Other resources who assist with or affect retrofit work are building owners or occupants, purchasing agents, facility managers, equipment suppliers, manufacturer's reps, etc. Electric and Gas utilities have program implementation staff already in the field working with customers to identify opportunities. Larger customers usually have access to funding as long as the payback is within 2 years. Smaller customers usually do not have access to funds, and may benefit from a low/no interest loan, energy efficiency mortgage, or some other quick and easy financing.
   c. *Barriers to Address (especially for medium to low feasibility actions):* The Pressure of Time, Higher First Cost, Lack of Information, Unfamiliar Technologies, Product availability, Owner vs. Occupant Issues, Informed and High Quality Contractors, Financial Resources.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):
   a. *Parties Responsible for Implementation:* Electric and natural gas utilities implement existing energy efficiency programs, working with the NHPUC, OEP, and interested parties. Commercial, Industrial and Municipal customers have staff responsible for justifying, approving and installing energy efficiency measures. Installation is often done by customers themselves or via energy service companies.

b. *Parties Paying for Implementation:* Electric and Gas customers through rates (base rates, SBC, Forward Capacity Market, RPS, RGGI), building owners (via internal budgets, investors or lenders).
Parties Benefiting from Implementation: Any business operating in New Hampshire (customers/owners, tenants, occupants) will benefit directly, as will energy service companies. All NH customers and occupants/visitors to the State of New Hampshire will benefit indirectly via rates or cleaner air quality due to reduced emissions.

4. Related Existing Policies and Programs: CORE Energy Efficiency Programs (e.g., Large C&I Retrofit Program, C&I New Equipment & Construction Program, Small Business Energy Solutions Program, SmartStart funding program, Building Operators Management Programs), Federal Tax Credits, EPA Energy Star Benchmarking program, ASHRAE, AFE, ASME, BOMA programs).

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
   a. *Existing:* See above, plus state and federal appliance standards, and state energy codes.
   b. *Proposed:* C&I Energy Demand Reduction; Integrating renewable energy additions and/or CO_2 reduction strategies into existing energy efficiency programs, EGU Actions 1.1, Revenue Decoupling and 1.2, Energy Efficiency Procurement.

6. Timeframe of Implementation: There are approximately 44,147 commercial and 2,314 industrial establishments in New Hampshire as of the 2006. It is likely to take a many years to complete this work.

7. Anticipated Timeframe of Outcome: CO_2e reductions would begin to accrue immediately as each business is retrofitted or renewable energy equipment installed.

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Efficiency Improvement	Source	CO_2 Emission Reductions		
		2012	2025	2050
15% More Efficient	Direct Fuel Use	0.07	0.29	0.36
	Electricity	0.09	0.40	0.48
	Total	0.16	0.69	0.84
30% More Efficient	Direct Fuel Use	0.14	0.58	0.71
	Electricity	0.19	0.80	0.97
	Total	0.32	1.38	1.68
50% More Efficient	Direct Fuel Use	0.23	0.97	1.19
	Electricity	0.31	1.33	1.61
	Total	0.54	2.29	2.80

2. Economic Effects
   a. Costs:
      i. Implementation Cost:

Efficiency Improvement	Relative Cost
15% More Efficient	Moderate
30% More Efficient	Moderate
50% More Efficient	Moderately High

      ii. Timing: Immediate / higher upfront for all scenarios
      iii. Impacts: Business – evenly distributed for all scenarios

b. Savings

i. Potential Economic Benefits:

Efficiency Improvement	Relative Cost
15% More Efficient	Moderately High
30% More Efficient	High
50% More Efficient	Very High

ii. Timing: Low short-term / mostly long-term for all scenarios

iii. Impacts: Business – evenly distributed for all scenarios

3. Other Benefits/Impacts:

a. *Environmental*: Other emissions from electric generation and burning of fossil fuels for thermal loads will be reduced. Potential benefits beyond CO_2e reductions include: water savings, reduced sewage, and peak demand savings.

b. *Health*: Personal comfort and air quality in building could be improved. Air quality in state could be improved by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

c. *Social*: The methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

d. *Other*:

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical*: There are several programs to improve efficiency of existing commercial & industrial buildings in place today (Electric Companies, Gas Companies). Current programs provide lighting retrofits, HVAC upgrades, air compressor upgrades, etc. There are many energy service companies and electricians in New Hampshire and neighboring states that provide these services, but more will be required.

b. *Economic*: Based on benefit/cost models currently used to evaluate NH efficiency programs, it is possible that some of the suggested retrofit measures may not be cost-effective. Most energy efficiency program funding models are based on a cost sharing arrangement whereby public funds are used to attract private investment as a means of funding each project. This model attempts to maximize the impact of public funds by requiring a significant private investment in each project. To the extent public funding for a project is reduced, more private investment will be required. While this will improve the cost-effectiveness of the public funds, fewer participants will be able to afford being involved in the program. To the extent public funding of a project is increased, overall available funding will be lower and fewer projects can be completed. Finding the right balance that will achieve the goal of retrofitting all 36,000 NH businesses while treating all participants equitably is likely to be a challenge.

c. *Statutory / Regulatory*: Continued SBC funding, availability of RPS or RGGI funds. In addition, the NH Public Utilities Commission is currently examining the issue of decoupling utility revenues from sales volume. Decoupling is intended to remove a potential barrier to a utility taking action to reduce sales and therefore revenues.

d. *Social*: Many people would be expected to support efforts to increase efficiency, especially as energy costs continue to rise.

5. Other Factors of Note: Additional data sources may include EPRI EE potential study, NHPUC EE potential study (ECD: August 2008), McKinsey & Co. Reducing US GHG emissions report, US EPA, DOE and national energy labs, CEE and ACEEE.

6. Level of Group Interest: High

7. References

   - Type (NAICS) and Quantity of NH Business Customers, http://www.census.gov/econ/census02/data/nh/NH000.HTM or http://data.bls.gov/PDQ/outside.jsp?survey=en
   - Annual MWH Usage of NH Commercial & Industrial Customers, http://www.eia.doe.gov/cneaf/electricity/page/eia826.html
   - Annual Fossil Usage of NH Commercial Customers, http://www.eia.doe.gov/emeu/states/sep_use/com/use_com_nh.html
   - Annual Fossil Usage of NH Industrial Customers, http://www.eia.doe.gov/emeu/states/sep_use/ind/use_ind_nh.html

RCI Action 1.4A – Upgrade Building Energy Codes

Summary

To ensure that future editions of New Hampshire's building energy code are appropriate, the state should participate in the IECC energy code update process, either on its own or by providing input through other regional partners that do participate, such as Northeast Energy Efficiency Partnerships (NEEP). However, there is considerable evidence that if the state is to achieve deeper greenhouse gas emission savings, it should make its building energy code more stringent than the current IECC.

New Hampshire first adopted an energy building code under RSA 155-D in 1979 and, through legislation, adopted the most recent edition of the International Energy Conservation Code (IECC2006) in 2007. The state recognizes that building energy codes represent one of the more cost-effective ways to reduce energy use (both electric and heating/cooling fuel) and the related carbon emissions. Energy codes can be used to regulate energy use in new construction and substantial renovation of all buildings, and, when administered in tandem with "stretch codes" or "beyond code" provisions, can also inform more stringent high-performance (or "green") construction standards to serve additional state policy objectives. By ensuring the regular update of New Hampshire's residential and commercial building energy codes with reference to the latest national/international model code as a baseline, the state would set as its "floor" the latest technologies and practices inherent in that most recently updated code. In addition, the state could then use an informative appendix to the code (similar to the "Field Guide for Residential Construction" currently available to New Hampshire builders) to define a preferred "higher floor" that sets beyond-code high-performance building standards.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result*): A building energy code is used to establish a minimum level of energy efficiency in new construction, renovations, and additions. The International Code Council (ICC) is a recognized leader in developing through consensus and technical review the latest building construction practices to maximize energy efficiency, as represented in the International Energy Conservation Code (IECC). New Hampshire currently has in place, through legislation, the most recent edition of that code. To ensure that future editions of the state's code are appropriate, the State of New Hampshire should participate in the IECC energy code update process, either on its own or by providing input through other regional partners that do participate, such as Northeast Energy Efficiency Partnerships (NEEP). However, the state could achieve deeper greenhouse gas emission savings by making its building energy code more stringent than the current IEC. It could do so by amending the code through the Building Code Review Board or by providing options or models for enhanced energy use standards that cities and towns could adopt pursuant to their authority under RSA 155-A:2 IV and 674:51 I. For example, using the most current IECC as a baseline, New Hampshire could set its own more stringent state building energy code to achieve energy savings of at least 20 percent beyond the IECC baseline in all new construction and substantial renovation. That standard could then continue to slide upward as the code is regularly revised and enhanced on a three-year cycle.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order)*: Building energy codes can be adopted by the General Court as in RSA 155:A IV or amended by rule by the Building Codes Review Board to the extent the board deems that such updates are necessary, subject to ratification by legislation within two years in accordance with RSA 155-A:1IV In several states in the region, legislation has been enacted or is under consideration to mandate that the state's building energy code be updated within a defined time frame, generally a year, from the date of the publication of the latest national model energy code.
    b. *Resources Required*: TBD
    c. *Barriers to Address (especially for medium to low feasibility actions)*: Current barriers to adoption of a more rigorous building energy code include the absence of a more recent version of a reference model code, the lack of any requirement for the state to update its building energy code when national model reference codes are updated, as well as the absence of a link between state energy and climate policy and

state building code policy. In general designers and builders also need a reasonable length of time to adjust to changes and operate under new codes. The code development community appears to have adopted a three year cycle as reasonable.

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):

    a. *Parties Responsible for Implementation*: The New Hampshire General Court establishes the state building energy code; the Buildings Code Review Board may adopt changes it deems necessary subject to ratification within two years by the General Court; individual cities and towns administer and enforce the code, as they do other building codes (mechanical, structural, health and safety, etc.). In addition, all new construction or substantial building renovation in the state of New Hampshire and parties related to it – architects, engineers, builders/contractors, local building officials, owners and occupants – will be impacted when new codes are adopted.

    b. *Parties Paying for Implementation*: The costs of implementation of updated codes are born by the administering and enforcing authorities including the Public Utilities Commission, the Fire Marshall, the municipalities and their code enforcement. These costs include education, training and administrative expenses. Under the provisions of RSA 155-A:9, municipalities may establish fees to defray their costs.

    c. *Parties Benefiting from Implementation*: All citizens and businesses in New Hampshire benefit from having buildings meet minimum building energy codes through reduced energy use, which can help to lower energy bills on an individual basis as was as through wholesale market clearing prices for electricity and other fuels. Additional benefits are realized by all parties from the reduced emissions of nitrous oxides, sulfur dioxide and carbon dioxide that are associated with electric generation.

4. Related Existing Policies and Programs: Currently, the New Hampshire Core utility energy efficiency programs offer incentives and/or technical support for new construction and retrofits. The programs' guidelines are reviewed and adjusted annually by the utilities and stake holders with Public Utilities Commission approval to ensure consistency with codes and standards as well as cost effectiveness and energy savings and emissions reductions goals.

5. Complementary Policies (i.e., those that achieve greater reductions through parallel implementation):

    a. *Existing*: As referenced, building energy codes should continue to work in a complementary fashion with:

        i. Ratepayer-funded energy efficiency programs, both for new construction, as well as those addressing specific technologies, such as lighting or HVAC equipment

        ii. State demonstration projects or programs addressing construction or renovation of publicly-funded facilities

        iii. Revenue programs to provide incentives for certain types of private sector actions, such as new construction standards

        iv. State guidance to municipalities seeking to implement energy management or climate change strategies at the local level.

    c. *Proposed*:

    SB 259, pending action by the Governor, would establish certain minimum appliance efficiency standards to be administered by the PUC. The state should regularly look to set new standards for product efficiency where appropriate. Where those standards are integral to building systems, i.e., HVAC, commercial lighting, those policies will need to be aligned with upgraded building energy codes. Similarly, if new energy efficiency programs are contemplated as a result of an increase in available funding, those programs addressing particular technologies will also need to be integrated with building energy code efforts. HB 1561, pending action by the Governor, would establish an Energy Efficiency and Sustainable Energy Board to promote and coordinate energy efficiency efforts by the state and would include representation from the State Fire Marshall's office.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
RCI Action 1.4B – Improve Building Energy Code Compliance
RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal
GLA Action 1.1 – Establish an Energy Management Unit
GLA Action 2.1 – Apply High-Performance Building Standards to New Construction and Renovations
GLA Action 2.2 – Maximize Energy Efficiency in Existing Government Buildings
GLA Action 3.1 – Encourage Renewable Energy and Energy Efficiency Projects for Existing State-Owned Buildings and Facilities
TLU 2.C actions are all complementary proposed policies.

6. Timeframe for Implementation: New Hampshire has recently adopted the most recent version of the IECC (2006), which is currently being revised and is scheduled for approval in September 2008, and then becomes available for adoption in January 2009.

7. Anticipated Timeframe of Outcome: Improvements to the building energy code, and related processes and policies, as well as the adoption of a beyond-code informative appendix, will yield long term energy savings and related emissions reductions as the building stock is replaced.

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
25% More Efficient	Direct Fuel Use	0.08	0.32	0.79
	Electricity	0.03	0.11	0.27
	Total	0.10	0.44	1.06
50% More Efficient	Direct Fuel Use	0.15	0.65	1.58
	Electricity	0.05	0.22	0.55
	Total	0.21	0.87	2.13

2. Economic Effects

   a. Costs:

      i. Implementation Cost:

Efficiency Improvement	**Relative Cost**
25% More Efficient Thermal	Moderate
50% More Efficient Thermal	Moderately High

      ii. Timing: Constant / even for both scenarios
      iii. Impacts: Evenly distributed for both scenarios

b. Savings:

i. Potential Economic Benefits:

Efficiency Improvement	Relative Benefit
25% More Efficient Thermal	Moderately High
50% More Efficient Thermal	High

ii. Timing: Low short-term / mostly long-term for both scenarios
iii. Impacts: Evenly distributed for both scenarios

3. Other Benefits/Impacts:

a. *Environmental*: Reductions in nitrogen oxides, sulfur dioxide and carbon dioxide, as well as other pollutants, resulting from decreased energy consumption.
b. *Health*: Additional benefits to code-compliant and high performance buildings include improved indoor air quality and fewer sick days. In urban areas, rates of childhood asthma may also impacted by reduced electric generation due to more efficient buildings.
c. *Social*: More efficient buildings save energy and money and help address the need to act to mitigate global climate change. In addition, evidence has shown improvements to occupant comfort and productivity in high performance buildings.
d. *Other*: Economic development also benefits through the growth in the "clean energy" sector of the state's economy, both in white collar (planning and implementation; inspection) and blue collar (installation; construction) jobs.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical:* Technically, the largest challenge in improving building performance through code and beyond code standards will come in the training and deployment of building officials who enforce the code as well as builders and contractors who understand and construct in compliance with the code.

b. *Economic*: The potential costs to the state and/or its communities and the construction sector is in higher construction costs that are typically outweighed by the economic benefits to the growth of the clean energy economy (see 3d, above), energy savings among consumers and businesses, and slowing of climate change that negatively impacts several key New Hampshire business sectors.

c. *Statutory/Regulatory:* New Hampshire has a legislatively defined process for reviewing and updating building energy codes. See RSA 155-A States across the Northeast are looking at building energy codes as a means of meeting both climate change goals and controlling energy costs, meaning a variety of information and best practices can be made available to inform either statutory or regulatory efforts.

d. *Social: Consumers*: Setting policies that address the biggest users of energy in the world – buildings – will require some education of the public. But once people understand that the average home uses exponentially more energy than the average car, the social acceptance of higher performing buildings is a much easier sell. Individuals and businesses are increasingly willing to make changes that reduce their energy costs and their carbon footprints, although many people may not fully appreciate the energy and climate impacts of their actions.

5. Other Factors of Note:

Objections may come from certain local building officials who constantly have to learn the provisions of a new code. Objections may also come from builders, for the same reason. Caution must be used in adopting new energy codes to ensure that the new code actually increases energy efficiency. Safeguard language on "backsliding" is generally used where states mandate updates to the latest model code, and is recommended for any strategy New Hampshire may pursue.

It may be helpful to note that the idea of taking climate change action through building codes and standards is increasing in the states of the Northeast U.S. Maine has recently adopted legislation tying its first ever mandatory statewide building energy code to the IECC, as well as to increase compliance levels through training

and certification of specialized building energy code inspectors. Pending legislation in Massachusetts would do the same. Other policy efforts in this regard have been seen in recent months in New York and New Jersey as well. In addition, many states also want to go "beyond code" to set even higher performance standards in order to achieve even greater energy savings where possible.

6. Level of Group Interest: High

7. References:

RCI Action 1.4B – Improve Building Energy Code Compliance

Summary

New Hampshire should consider mechanisms that would result in stricter enforcement of energy codes. Building energy codes represent one of the more cost-effective ways to reduce long-term energy use (both electric and heating/cooling fuel) and the related carbon emissions. Energy codes can be used to regulate energy use in new construction and substantial renovation of all buildings, and, when administered in tandem with "stretch codes" or "beyond code" provisions, can also inform more stringent high-performance (or "green") construction standards to serve additional state policy objectives. However, any effort to capture savings from building energy codes has to come with the understanding that the best code is only as good as the compliance with that code. The state might consider a formal certification process for inspectors beyond the current voluntary process offered through the ICC. Consideration should be given to developing a system to promote strict enforcement of the state's building energy code, even in rural communities, to ensure that all new structures are in compliance.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   Many New Hampshire communities do not have a local code official to enforce any aspect of the state's building code, effectively leaving new construction in those communities un-inspected. And although free training on the building energy code has been offered to builders and code officials consistently since the inception of the code nearly 30 years ago, the training process must continue to be examined for areas of improvement.

   Consequently, the state should consider mechanisms that would result in stricter enforcement of the energy code. Measures might include a formal certification process for inspectors beyond the current voluntary process offered through the ICC and development of a system to promote strict code enforcement even in New Hampshire's rural communities.

   Although there is no definitive analysis of compliance rates with the building energy code in New Hampshire, NEEP did commission a survey of code officials in New Hampshire and Rhode Island in 2001 to gain a sense of the local issues related to administration of the building energy code. Of note were the following:

   - A question asking local code officials to assess their knowledge of the residential building energy code revealed that only 41 percent considered their knowledge of the code "very good." With regard to the commercial code, only 16 percent assessed their knowledge level as "very good," and a full 30 percent said they had "not very much" knowledge at all.
   - Only 30 percent of the officials had ever received any training in the commercial energy code.
   - Perhaps most troubling, the report noted that: "Large areas of the state, generally central and northern NH do not have anyone responsible for energy code compliance at the town level. Responses from the contact activity suggest this lack is generally a resource lack: there is no one with the appropriate expertise in the energy codes (other aspects of building codes are enforced), or there is a lack of financial resources to fund this aspect of compliance activity."

   The state legislatively adopts the energy code on a statewide basis, but it is enforced on a municipal level, along with other aspects of the building code. Thus, realizing the energy savings in the code depends on appropriate administration and enforcement at the local level; and, as noted above, there is at least significant anecdotal evidence that compliance rates fall well short of 100 percent. Perhaps the most effective model for increasing code compliance rates is the Washington state model of specialized building energy code enforcement, where trained and certified building energy code inspectors are responsible for the energy portions of the building energy code. This specialized inspector would ideally be a third party, although local building inspectors could opt to perform that specialized energy inspection themselves, provided they are properly trained and certified. The specialized inspection could be paid for out of the building permit fee or otherwise included as part of the cost of building the structure, sparing the municipality from any unfunded mandate. The state of Maine, in

recently adopting that state's first-ever mandatory statewide building code, included a provision for establishing such a specialized enforcement function for review and approval of the energy section of the building code.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

    a. *Method of Establishment (e.g., legislation, executive order)*: Regulations governing building energy codes can be set either administratively or legislatively. However, to develop the appropriate mandate and link code regulations to other state energy policies – such as those addressing climate change action – it is recommended that a legislative mandate be pursued. Such mandate should direct the appropriate state agency to develop requirements and promulgate regulations for the training and certification of municipal building inspectors regarding the provisions of the state building energy code. Further, that mandate should require that all new construction or substantial renovation of buildings pass inspection only by inspectors who have been trained and certified, demonstrating full compliance with the energy provisions of the state building code.

    Under existing statute, RSA 155-A:7I, the State Fire Marshal or his designee has authority to enforce the state building code in municipalities without a building inspector. Provision II of that statute allows state agencies, boards and commissions to provide advisory services and technical assistance to any enforcement authority requesting such service. Obviously, staffing and monetary constraints limit the amount of such support that is available but additional funds and resources might be made available to underwrite such help. Either Executive Order or budget authority could be used to expand the availability of these existing resources to more municipalities.

    Locally, under RSA 155-A:9 a municipality may establish fees to cover the costs of administration, implementation and enforcement of the building code. However, for whatever reasons, many municipalities do not devote significant resources to energy code enforcement, while some do. A state-wide mechanism to certify inspectors beyond the current voluntary system could be established. As trained inspectors are currently often employed by multiple municipalities, the cost of certifying inspectors for each community could be minimizing by sharing personal on a regional basis. RSA 21-J:14-h-j, concerning cooperative assessment districts provides one model that might better enable regional cooperation on code enforcement.

    b. *Resources Required*: Funding for such an effort or to provide supplementary inspectors devoted to the energy code could come from various sources, including special building permit fees and the GHG Emissions Reduction Fund under RSA 125-O:23 Continued training of code officials at the state level remains essential.

    c. *Barriers to Address (especially for medium to low feasibility actions)*: The current barriers that exist to greater compliance with building codes in general and building energy codes in particular often relate to:

        - Resistance to government regulation and inspection by some members of society and the traditional primary role of municipalities in code enforcement, both of which result in varied levels of enforcement;
        - Lack of a mechanism to ensure enforcement at the municipal level;
        - Lack of understanding of building energy codes at the municipal level; and
        - The lower priority given to energy codes by local building officials in comparison with health and safety codes.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

    a. *Parties Responsible for Implementation*: Building energy codes can be adopted by the General Court as in RSA 155-A:1, IV or amended by rule by the Building Codes Review Board to the extent the board deems that such updates are necessary, subject to ratification by legislation within two years in accordance with RSA 155-A:10, V. Individual cities and towns administer and enforce it, as they do

other building codes (mechanical, structural, health and safety, etc.). In addition, all new construction or substantial building renovation in the state of New Hampshire and parties related to it – architects, engineers, builders/contractors, local building officials, owners and occupants – will be responsible for increased compliance.

b. *Parties Paying for Implementation*: In a system of supplemental or specialized energy code inspectors, the certified energy code inspectors would be responsible for certifying compliance with the code to the local building official. Those supplemental or specialized energy code inspectors could be paid for by the owner or builder as part of the building permit fee in order to relieve the municipality or the state of the budgetary burden. Otherwise, other grants or programs would be needed to fund the specialized code inspectors, which might include the GHG Emissions Reduction Fund under RSA 125-O:23.

c. *Parties Benefiting from Implementation*: All citizens and businesses in New Hampshire benefit from having buildings meet minimum building energy codes through reduced energy use, which can help to lower energy bills on an individual basis as well as through wholesale market clearing prices for electricity and other fuels. Additional benefits are realized by all parties from the reduced emissions of nitrous oxides, sulfur dioxide and carbon dioxide that are associated with electric generation.

4. Related Existing Policies and Programs: Currently, the New Hampshire Core utility energy efficiency programs offer incentives and/or technical support for new construction and retrofits. The programs' guidelines are reviewed and adjusted annually by the utilities and stake holders with Public Utilities Commission approval to ensure consistency with codes and standards as well as cost effectiveness and energy savings and emissions reductions goals.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing*: As referenced, building energy codes should continue to work in a complementary fashion with:

      i. Ratepayer-funded energy efficiency programs, both for new construction, as well as those addressing specific technologies, such as lighting or HVAC equipment, including Energy Star Homes.

      ii. State demonstration projects or programs addressing construction or renovation of publicly-funded facilities

      iii. Revenue programs to provide incentives for certain types of private sector actions, such as new construction standards

      iv. State guidance to municipalities seeking to implement energy management or climate change strategies at the local level.

   b. *Proposed*:

      SB 259, pending action by the Governor, would establish minimum appliance efficiency standards, and the state should regularly look to set new standards for product efficiency where appropriate. Where those standards are integral to building systems, i.e., HVAC, commercial lighting, those policies will need to be aligned with upgraded building energy codes. Similarly, if new energy efficiency programs are contemplated as a result of an increase in available funding, those programs addressing particular technologies will also need to be integrated with building energy code efforts. HB 1561, pending action by the Governor, would establish an Energy Efficiency and Sustainable Energy Board to promote and coordinate energy efficiency efforts by the state and would include representation from the State Fire Marshall's office.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
RCI Action 1.4A – Upgrade Building Energy Codes
RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach

RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal
GLA Action 1.1 – Establish an Energy Management Unit
GLA Action 2.1 – Apply High-Performance Building Standards to New Construction and Renovations
GLA Action 2.2 – Maximize Energy Efficiency in Existing Government Buildings
GLA Action 3.1 – Encourage Renewable Energy and Energy Efficiency Projects for Existing State-Owned Buildings and Facilities
TLU 2.C actions are all complementary proposed policies.

6. Timeframe for Implementation: Initiatives to enhance energy code compliance can and should begin as soon as possible.

7. Anticipated Timeframe of Outcome: Increased building energy code enforcement and related processes and policies, will yield long term energy savings and related emissions reductions as the building stock is replaced.

Program Evaluation

1. Estimated CO_2 Emission Reductions (MMTCO2e/year):

Efficiency Improvement	**Source**	**CO_2 Emission Reductions**		
		2012	**2025**	**2050**
50% Compliance (3% greater thermal efficiency)	Direct Fuel Use	0.01	0.04	0.09
	Electricity	0.00	0.01	0.03
	Total	0.01	0.05	0.13
80% Compliance (6.6% greater thermal efficiency)	Direct Fuel Use	0.02	0.09	0.21
	Electricity	0.01	0.03	0.07
	Total	0.03	0.12	0.28

2. Economic Effects

   a. Costs:
      i. Implementation Cost: Low for both scenarios
      ii. Timing: Constant / even for both scenarios
      iii. Impacts: Local government for both scenarios

   b. Savings:
      i. Potential Economic Benefit:

Efficiency Improvement	**Relative Benefit**
50% Compliance (3% greater thermal efficiency)	Moderately Low
80% Compliance (6.6% greater thermal efficiency)	Moderate

      ii. Timing: Low short-term / mostly long-term for both scenarios
      iii. Impacts:

3. Other Benefits/Impacts:

   a. *Environmental*: Reductions in nitrogen oxides, sulfur dioxide and carbon dioxide, as well as other pollutants, resulting from decreased energy consumption.

   b. *Health*: Additional benefits to code-compliant and high performance buildings may include improved indoor air quality and fewer sick days. In urban areas, rates of childhood asthma may also impacted by reduced electric generation due to more efficient buildings.

c. *Social*: More efficient buildings save energy and money, and address the need to act to mitigate global climate change. In addition, evidence has shown improvements to occupant comfort and productivity in high performance buildings.

d. *Other*: Economic development also benefits through the growth in the "clean energy" sector of the state's economy, both in white collar (planning and implementation; inspection) and blue collar (installation; construction) jobs.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

   a. *Technical:* There is no technical reason why the energy code should not be strictly enforced. The tools are available to assess air exchange rates (blower doors) and insulation deficiencies (thermal imaging).

   b. *Economic:* The potential costs to the state and/or its communities of increased compliance with code and higher construction costs would be outweighed by the energy savings among consumers and businesses and the state's reduced reliance on imported energy and slowing of the climate change that negatively impacts several key New Hampshire business sectors.

   c. *Statutory/Regulatory:* New Hampshire currently has the most aggressive nationally recognized energy code. Several states in the region have also recently begun to set more aggressive policies regarding state building energy codes as a means of addressing multiple policy issues, ranging from the high costs of energy to climate change action strategies. Maine, for example, this spring just enacted its first ever mandatory statewide building code, and included in it provisions for specialized energy code inspectors as a means of enhancing compliance with the code. Similar legislation is expected to be enacted in Massachusetts in the current session. New Hampshire can benefit from the experiences and expertise of these two states in developing both its legislative language mandating enhanced training and certification processes, as well as the regulations governing compliance.

   d. *Social:* Consumers – individuals and businesses – are looking for more opportunities to reduce their carbon footprints and control energy costs. Most citizens expect that if a code exists, then it is enforced and any structure complies. It is only fair to building owners and builders that a "level playing field" be maintained meaning that the consumers gets what she or he pays for.

5. Other Factors of Note: Objections may come from some builders, who may argue against any changes in the status quo. They may object to increases in building costs and permit fees. Caution must also be used if requiring specialized, third-party inspectors, to ensure that the market is adequately prepared to handle such a mandate. Because there could initially be a scenario where there wouldn't be enough qualified raters to deal with all new construction in New Hampshire, default plans may be required so that if a qualified inspector cannot be secured in a reasonable time frame, a building would be deemed to be in compliance with the building energy code.

   It may be helpful to note that the idea of taking climate change action through building codes and standards is increasing in the states of the Northeast U.S. As noted, both Maine and Massachusetts have either enacted or are about to enact legislation to tie their state building energy codes to the latest IECC, as well as to increase compliance levels through training and certification of specialized building energy code inspectors. Other policy efforts in this regard have been seen in recent months in New York and New Jersey as well. In addition, many states also want to go "beyond code" to set even higher performance standards in order to achieve even greater energy savings where possible.

6. Level of Group Interest: High

7. References: Local Code Officials Survey, Conducted for the Northeast Energy Efficiency Partnership, Inc. (NEEP) by Peregrine Energy Group, November 2001.

RCI Action 1.5 – Establish an Energy Section in MLS Listings

Summary

An energy section should be included in the Multiple Listing Service (MLS) real estate listings. This measure would provide for the establishment of a specific, defined set of energy-related criteria/ratings for properties presented in the MLS listings. The concept behind an MLS energy section is to reinforce the fact that energy is a major factor in home buying and to provide the consumer with a means for comparing energy usage between homes.

Program Description:

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Including an energy section in MLS listings would promote energy savings by educating realtors, consumers, home sellers, and home buyers. Presumably, properties that are energy-efficient would be favored over similar properties that require greater energy consumption; and market pricing would reflect this advantage. This program is not unlike mileage stickers on new cars.

2. Implementation Plan (*i.e., how to implement the specific policy or program*):
    a. *Method of Establishment (e.g., legislation, executive order):* In the short-term: develop criteria; established standards; and implement listings changes. In the medium-term: develop awareness of these standards; and increase consumer demand for energy efficient/low carbon footprint construction
    b. *Resources Required:* Educational programs and materials to educate the real estate agencies regarding that the ratings mean and how to help homeowners and homebuyers inexpert their meaning.
    c. *Barriers to Address (especially for medium to low feasibility actions)*

3. Parties Affected by Implementation (i.e., residents, businesses, municipalities, etc.):
    a. *Parties Responsible for Implementation:* The NH Department of Environmental Services, other state agencies, the New Hampshire Association of Realtors, the Energy Efficiency and Sustainable Energy Board, the legislature, individual towns, and potentially the State Real Estate Board.
    b. *Parties Paying for Implementation:* Real estate industry, homeowners, builders and developers.
    c. *Parties Benefiting from Implementation:* New homeowners

4. Related Existing Policies and Programs:
    a. The rating system information has become integral to the housing market in Alaska. A home's energy rating is included in the MLS and the state's appraisal institute data base. Because of this market data, appraisers routinely add value for higher-rated homes. Other states are taking steps to incorporate the collection of this market data. The rating systems in Colorado, Rhode Island, and Oregon now have the option of including the energy information in the MLS. However, in reviewing the listings, the energy usage and green rating are not yet available. See the following websites: http://resnet.us/ratings/overview/resources/primer/HP09.htm and http://www.rmls.com/RC2/UI/search_residential.asp.
    b. Listedgreen.com is an online MLS exclusively listing energy efficient, sustainable homes, and housing developments worldwide. They require a $20 monthly fee for each listing. See http://www.listedgreen.com/).
    c. Washington, California, Nevada, Arizona, Colorado, Texas, Wisconsin and Georgia have organizations that provide information to their residents and builders to help them buy and build green, and issue green ratings. See the following websites:

        http://www.builtgreenwashington.org/
        http://www.builditgreen.org/
        http://www.nvgreenbuilder.com/
        http://www.scottsdaleaz.gov/greenbuilding/

http://www.builtgreen.org/about/overview.htm
http://www.austinenergy.com/Energy%20Efficiency/Programs/Green%20Building/index.htm
http://www.greenbuilthome.org/owner/index.php
http://www.earthcrafthouse.com/

d. The University of North Carolina's NC HealthyBuilt Homes Program provides a certificate for green residential homes. See http://www.healthybuilthomes.org/.

e. MyEnergyLoan.com offers green loan packages where they incorporate all available incentives into the loans. See http://www.myenergyloan.com/.

f. Ecobroker International offers online courses to for licensed real estate brokers to earn the Ecobroker certified designation. Participants have to complete energy, environmental and marketing training programs which will allow them to stay current on the green real estate market. See http://www.ecobroker.com/eb/default.aspx.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

a. *Existing:* Through the existing electric and gas utility programs incentives are provided for Energy Star rated single and multi-family residential construction. This involves plan review, inspection and rating of each project consistent with the Energy Star Home Energy Rating Systems (HERS). A basic infrastructure of qualified and experienced home energy raters has developed partially in response to these other residential audit and weatherization programs, providing a foundation for expanded home energy audits and ratings. See also www.repa-nh.org.

b. *Proposed:* There are limited existing Energy Efficient Mortgage (EEM) programs, including through HUD/FHA, VA, Fannie Mae, and Freddie Mac. The basic concept of an EEM is to finance more capital investment in above standard energy efficiency measures over the term of the loan (in both new and refinanced/retrofitted homes) that will reduce operational costs for heating and cooling, resulting in net savings. Normal debt to income ratios may be adjusted accordingly. The Energy Programs Consortium (EPC) (www.energyprograms.org) is a joint venture of the National Association of State Community Services Programs (NASCSP), the National Association of State Energy Officials (NASEO), the National Association of State Regulatory Utility Commissioners (NARUC), and the National Energy Assistance Directors' Association (NEADA), that is working to facilitate a large scale expansion of EEMs, including through state housing finance authorities. A number of foundations, US EPA and US DOE are supporting this effort and this product is on track to be designated an "Energy Star" mortgage. EEMs necessarily entail the use some form of a home energy rating system. For more information see www.energyprograms.org/briefs/0704-EEM.pdf.

RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.4B – Improve Building Energy Code Compliance
RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program *(formerly RCI Action 1.6)*
RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal

6. Timeframe for Implementation: Immediate and ongoing.

7. Anticipated Timeframe of Outcome: Results will be small at first, but grow exponentially as changes are understood and accepted.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderately low
        ii. Timing: Constant / even
        iii. Impacts: Consumer – evenly distributed

    b. Savings:

        i. Potential Economic Benefit: Supporting mechanism only
        ii. Timing:
        iii. Impacts: Consumer – evenly distributed

3. Other Benefits/Impacts:

    a. *Environmental:* This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

    c. *Social*: Increased awareness and implementation of energy saving and sustainable generation efforts through public participation and education will alleviate climate change. However, methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

    d. *Other*: Supporting renewables and conservation lowers the amount of greenhouse gases emitted into the atmosphere, reduces the load on our aging and maximized infrastructure, and creates a demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*):

    a. *Technical:* Ground breaking work has been initiated in other states and New Hampshire should be able to build on this work. While some relatively sophisticated home ratings are already in use in New Hampshire (e.g. HERS), a simple solution such as including the annual fuel usage over the past year on all property listings may be equally effective (e.g. gallons of oil/propane, therms of natural gas, kWhs of electricity, etc).

    b. *Economic:* Methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

    c. *Statutory/Regulatory:* It may be possible to work with industry organizations to implement this change without additional statues or regulations – but they are an option.

    d. *Social:*

5. Other Factors of Note: Massachusetts is considering home energy scoring language in Senate Bill 2468 during the 2008 session of the legislature.

6. Level of Group Interest: High

7. References:

RCI Action 1.7 – Preserve Older Buildings and Neighborhoods as Components of Sustainable Communities

Summary

State policies and programs exist that would promote the reuse, rehabilitation, and preservation of older buildings and neighborhoods. This action would collect and promote these policies and programs, promoting the conservation of embodied energy and avoiding the expenditure of new energy by first maximizing the use of rehabilitated older buildings and neighborhoods as a matter of public policy. Current urban planning policies are recognizing that increased density, as is present in older plats, reduces energy use in transportation, new infrastructure, building materials, and landscaping. Compact communities, such as New Hampshire villages and urban centers, promote a pedestrian-friendly lifestyle and may provide nodes for public transit; they also preserve open space. Many of the buildings extant in these centers are underutilized, with their upper stories no longer serving their intended business or residential uses. Full use of these spaces would provide greater density with little additional carbon impact and would preserve the original, sustainable plans of these New Hampshire communities.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* The public policy of conserving older buildings and neighborhoods as components of sustainable communities provides for the conservation of embodied energy while avoiding the expenditure of new energy. These objectives are achieved by reducing the need for demolition, replacement of structures, and expansion of infrastructure.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* Utilize existing legislation found in Chapter 266 of the New Hampshire Session Laws of 2002 regarding the preservation and rehabilitation of historic and culturally significant buildings and structures. Develop further legislation, as appropriate to enable communities to adopt appropriate criteria for the continued use or reuse of older commercial and industrial buildings, and to ensure that matters of life safety, fire protection, structural integrity, handicapped accessibility, energy conservation, traffic, parking, and other health and safety considerations for such buildings are satisfied in a responsible but flexible manner.
    b. *Resources Required*: Training personnel and writers be employed to hold conferences and prepare training manuals envisioned by and described in Chapter 266. Energy conservation must be given augmented emphasis.
    c. *Barriers to Address (especially for medium to low feasibility actions):* Lack of staff and/or funding for the employment of qualified consultants and for the publication of the authorized handbook and/or other media.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
    a. *Parties Responsible for Implementation:* The New Hampshire Department of Cultural Resources, New Hampshire Department of Safety, and municipal code and safety officials, and zoning and planning boards, statewide
    b. *Parties Paying for Implementation:* Not yet identified.
    c. *Parties Benefiting from Implementation*: New Hampshire communities statewide.

4. Related Existing Policies and Programs: New Hampshire RSA 227-C:1 is committed to the conservation of older buildings and neighborhoods. New Hampshire RSA 672:1 III-e encourages the kind of residential density that might be achieved through the adaptation of underutilized space in existing buildings.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
    a. *Existing:* New Hampshire RSA 21-I-19-a states that "it shall be the policy of the State of New Hampshire to maximize use of economical energy efficient measures in the construction, renovation and

maintenance of buildings owned or leased by the state. Further, it shall be the policy of the state to encourage municipalities to incorporate such measures into their buildings to the greatest extent possible."

b. *Proposed*
RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
RCI Action 1.8 – Conserve Embodied Energy in Existing Building Stock

6. Timeframe for Implementation: Depends on the availability of funding and possibly on the reestablishment of a demonstration program that offers financial incentives.

7. Anticipated Timeframe of Outcome: The outcome of the proposed policy will depend upon the speed with which the policy may be adopted and implemented, and on the responsiveness of the private sector in investing in the retrofit of unused or underutilized space in existing communities.

Program Evaluation

1. Estimated CO2 Emission Reductions: This action not individually quantified.

2. Economic Effects

a. Costs

i. Implementation Cost: Low
ii. Timing: Immediate / higher initial costs
iii. Impacts: State government

b. Savings

i. Potential Economic Benefit: Supporting mechanism only
ii. Timing:
iii. Impacts:

3. Other Benefits/Impacts

a. *Environmental*: The health benefits cited by RSA 9-B as an outcome of the type of building use envisioned by this policy are:

- Decreased water and air pollution
- Clean aquifer recharge areas
- Viable wildlife habitat

b. *Health*: The improved environmental conditions will have direct impacts of respiratory and cardiovascular health.

c. *Social*: The social benefits envisioned by this policy are:

- Vibrant commercial activity within cities and towns
- Strong sense of community identity
- Adherence to traditional settlement patterns when siting municipal and public buildings and services
- Ample alternate transportation modes
- Uncongested roads
- Attractive views of the landscape
- Preservation of historic village centers

d. *Other*: This policy fulfills legislative intent as codified in RSA 9-B; RSA 21-I-19-a; RSA 227-C:1-a; RSA 672; and Chapter 266 of the New Hampshire Session Laws of 2002.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

    a. *Technical*: There is already sufficient theoretical knowledge to deal analytically and technically with the adaptation of older buildings for enhanced social benefit while preserving their embodied energy and thereby reducing potential CO_2 release.

    b. *Economic*: Funding may be required in order to induce developers to undertake such projects, thereby instilling confidence and illustrating the feasibility of rehabilitating upper floors and other underutilized portions of older buildings.

    c. *Statutory/Regulatory*: Further legislation may be required to enable communities to adopt appropriate criteria for the continued use or reuse of older commercial and industrial buildings, and to ensure that matters of life safety, fire protection, structural integrity, handicapped accessibility, energy conservation, traffic, parking, and other health and safety considerations for such buildings are satisfied in a responsible but flexible manner.

    d. *Social*: Social factors affecting the potential for implementation may include changing attitudes toward mixed building uses, residential occupancy of upper stories, reliance on public transportation as distinct from the automobile, and increased population density in village or urban districts. Current demographic studies indicate that Americans are willingly returning to cities and are readopting urban modes of living. These trends suggest that there will be a positive social response to the principles of this policy, thereby ensuring the realization of the environmental benefits that underlie the policy.

5. Other Factors of Note: This policy combines principles of smart growth and building conservation to obtain an environmental benefit affecting climate change. Many indicators suggest that New Hampshire is ready to merge several initiatives in order to obtain the multiple benefits offered by this policy, which in fact represents a return to modes of social organization and building use of the pre-automobile age.

6. Level of Group Interest: Medium

7. References:

RCI Action 1.8 – Conserve Embodied Energy in Existing Building Stock

Summary

State-wide policies and programs should be developed that recognize, quantify, and encourage the conservation of the energy embodied in the New Hampshire's older building stock. This action would reduce future energy consumption and emissions both directly through energy conservation and indirectly through the preservation of the embodied energy in existing buildings. If these potential energy savings and reduction in carbon emissions are to be realized, the proposed action will require research, education, and incentive programs that incorporate conservation of embodied energy as well as life-cycle assessment of buildings, components and materials.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   The action would preserve the embodied energy of the existing building stock. "Embodied energy is the total expenditure of energy involved in the creation of the building and its constituent materials," and the energy invested in it throughout its use.[2] Embodied energy is a key component of life-cycle analysis, which examines the environmental impact of building materials and systems from raw material, through use within a building, to demolition and disposal. Under this concept, energy is conserved within the existing building, it is not expended in demolition or new construction, and new materials needs are minimal, even in an efficiency-increasing project.

   Research and educational programming are first needed to implement this action. The methodology requires calculations to be made, appropriate to New Hampshire conditions and building stock, that take into account life-cycle analysis and embodied energy when energy audits are performed or when rehabilitation projects are planned. Existing research and calculations will make this process easier, requiring only study to determine which models are most appropriate for New Hampshire. The final product would be New Hampshire-specific testing tools and an energy rating system, possibly to be used for the energy audits recommended as a baseline calculation in HB 1434 (2008).

   Education programs are needed to widely introduce the concept of embodied energy, which is unknown to most people – even professionals in the building and construction industries. Professionals, building owners and managers, and homeowners would be the target of this education, accomplished through a variety of public outlets and public-private partnerships. A list of best practices and demonstration projects that increase the energy efficiency of historic and older structures while preserving embodied energy would be developed and widely distributed.

   Greater reductions could be achieved through incentives developed at the state and local levels. Incentives may already exist, or may be proposed in other action items; these could be adapted to promote good use of embodied energy and encourage life-cycle analysis of systems and materials proposed in building upgrades. Further reductions could be achieved with the implementation of state or local regulations that mandate building conservation (not incorporated into this action item).

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

   a. *Method of Establishment (e.g., legislation, executive order):* The proposed action could be implemented at the direction of a commission comprised of architectural, preservation, and building professionals to research and develop calculations and educational programming. Other participants would include a council of existing state and local agencies, including the municipal energy committees proposed by HB 1434, and appropriate private industry partners to formulate educational opportunities and incentives programs.

[2] Donovan Rypkema, "Economics, Sustainability, and Historic Preservation," keynote address at the National Trust Conference, Portland, Oregon, 1 October 2005.

b. *Resources Required:* Existing research and previous initiatives within state government (1970s energy policy, 2000 smart growth initiative, as well as others) will provide the information necessary to craft the calculations systems. The formation of a board to helm this initiative would keep it on track; the programs can then be implemented as part a variety of existing programs.

c. *Barriers to Address (especially for medium to low feasibility actions):* Misinformation and a lack of knowledge concerning the importance of embodied energy will require outreach to and education for officials, professionals, and property owners. Market barriers and mistaken assumptions, such as the idea that new materials, such as PVC, are more energy-efficient than traditional wood, need to be addressed.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* Legislature, Governor's Office, Executive Council, state agencies, municipal government, educational organizations.

   b. *Parties Paying for Implementation:* Implementation would build on existing programs. The state, educational institutions or private industry would fund the development of research and education programs.

   c. *Parties Benefiting from Implementation:* Property owners would benefit from the enhancement of their properties, better access to energy efficiency programs, and reduced energy costs. Towns would benefit from the reduction in construction waste and decreased stress on infrastructure.

4. Related Existing Policies and Programs: LEED certification, Smart Growth initiatives, code flexibility for historic buildings, energy conservation education through OEP and local utilities.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing*: RSA 266-1, RSA 21-I-9, International Existing Building Code (existing, but not adopted in New Hampshire), House Bill 1434, 2008, state fire code, NFPA 909 and NFPA 914.

   b. *Proposed*:
   LEED 3.0/2010
   RCI Action 1.2 – Maximize Energy Efficiency in Existing Residential Buildings
   RCI Action 1.3 – Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings
   RCI Action 1.4A – Upgrade Building Energy Codes
   RCI Action 1.4B – Improve Building Energy Code Compliance
   RCI Action 1.7 – Preserve Older Buildings and Neighborhoods as Components of Sustainable Communities
   RCI Action 4.1 – Include Energy Efficiency and Conservation in School Curriculum
   RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs
   RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach
   RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program

6. Timeframe for Implementation: Study commission created as soon as feasible. Education programs to be developed contiguously.

7. Anticipated Timeframe of Outcome: Each phase to be implemented as information develops.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderately high
        ii. Timing: Constant / even
        iii. Impacts:

    b. Savings:

        i. Potential Economic Benefit: High
        ii. Timing: Constant / even
        iii. Impacts:

3. Other Benefits/Impacts:

    a. *Environmental*: "The continued use of our existing buildings reduces the amount of demolition and construction waste deposited in landfills, lessens unnecessary demand for energy and other natural resources, and conserves embodied energy."[3] Also, most older buildings are constructed of renewable, sustainable, natural materials requiring a minimum of manufacturing energy to create and maintain.

    b. *Health*: Sustainable historic materials and traditional construction promote a healthy indoor environment through the use of natural ventilation, natural light, and minimally manufactured materials that do not emit toxic gases at the beginning of their life cycles.

    c. *Social*: "[P]reservation of existing neighborhoods and commercial districts embodies the concept of a sustainable society. Preserving and continuing to use existing neighborhoods with their closely integrated network of houses, schools, parks, open spaces, streets, alleys, and religious institutions provides residents with an environment that encourages human interaction."[4]

    d. *Other*: "The long-term erosion in the inventory of old homes is basically irreversible. Demolitions and disaster losses are the current major reason old residential units fall out of the inventory, and there is no recovery from these processes. The number of old units is likely to continue to dwindle through decay and through outright elimination in order to reuse the property. However, these old houses have already weathered numerous storms in their lifetime, and many have the utility, substance, and unique character to continue as housing for many more years."[5]

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):*

    a. *Technical*: There is already sufficient theoretical knowledge to deal analytically and technically with the adaptation of older buildings for enhanced social benefit while preserving their embodied energy and thereby reducing potential CO_2 release.

    b. *Economic*: Funding may be required in order to induce developers to undertake such projects, thereby instilling confidence and illustrating the feasibility of rehabilitating upper floors and other underutilized portions of older buildings.

    c. *Statutory/Regulatory*: Further legislation may be required to enable communities to adopt appropriate criteria for the continued use or reuse of older commercial and industrial buildings, and to ensure that matters of life safety, fire protection, structural integrity, handicapped accessibility, energy conservation, traffic, parking, and other health and safety considerations for such buildings are satisfied in a responsible but flexible manner.

[3] National Trust for Historic Preservation, "Sustainability Fact Sheet," quoting an US Energy Information Agency study. Accessed 7 May 2007 at http://www.preservationnation.org/issues/sustainability/additional-resources/the-facts-about-preservation-a.html.

[4] Call for Papers: 6th National Forum on Historic Preservation Practice, A Critical Examination of Preservation and Sustainability, October 2007.

[5] Barbara T. Williams, "These Old Houses: 2001," Current Housing Reports, US Census Bureau, February 2004, 22.

d. *Social*: Social factors affecting the potential for implementation may include changing attitudes toward mixed building uses, residential occupancy of upper stories, reliance on public transportation as distinct from the automobile, and increased population density in village or urban districts. Current demographic studies indicate that Americans are willingly returning to cities and are readopting urban modes of living. These trends suggest that there will be a positive social response to the principles of this policy, thereby ensuring the realization of the environmental benefits that underlie the policy.

5. Other Factors of Note:

"The Northeast had the smallest supply of housing in 2001 – 18.8% of the nation's total…The Northeast was home to 43.4% of the nation's stock of about 10 million old homes [defined as any house built before 1920]…, reflect[ing] its earlier period of settlement."[6]

The federal census reports that approximately 140,000 of the estimated 660,000 total housing units in the state were built before1940.[7] Buildings constructed prior to 1920 have shown, in recent studies, to be more energy efficient than those built at any time in the rest of the century.[8] The majority of these buildings were constructed using sustainable, often local, and repairable materials, were site-oriented for maximum energy efficiency, and incorporate passive energy-conserving design features (natural lighting, cross-ventilation, etc.). Best practices for the maintenance of these older buildings, including energy efficient improvements, call for repairing existing building fabric or replacing in-kind with traditional building materials, which tend to be renewable and require minimal manufacturing. This results in a smaller carbon footprint for the project than would full replacement with new materials. Research, education, and incentives will increase the number of these types of projects in New Hampshire.

6. Level of Group Interest: Medium

7. References:

[6] Barbara T. Williams, "These Old Houses: 2001," Current Housing Reports, US Census Bureau, February 2004, 3.

[7] According to the NH Office of Energy and Planning website, accessed 6 June 2008, 32.3% of net energy overall is used to heat buildings and structures, and another 36.6% is used to generate electricity. Net energy use by the residential sector is 14.7% of the total NH energy use.

[8] Energy Information Administration, "2003 Buildings Energy Consumption Survey: Building Characteristics Tables." Revised June 2006, Table B24, 150.

RCI Action 2.1 – Create Incentive Programs to Install Higher-Efficiency Equipment, Processes, and Systems

Summary

Incentive programs should be developed to increase the installation of higher-efficiency equipment and the adoption of higher-efficiency processes. Commercial, industrial, and municipal processes can significantly reduce net CO_2 output by properly designing process lines and using high-efficiency lighting and equipment (e.g. motors, transformers, VFDs, energy management and compressed air systems, etc.). The CORE Programs offered by the electric utilities currently provide these services for electricity-saving measures, and the gas utilities have comparable services for reducing natural gas consumption. Programming must be expanded to cover all cost-effective measures that reduce CO_2e emissions regardless of fuel type, including the use of renewable generation and use of combined heat and power (CHP). A combination of targeted and comprehensive energy audits could be used to identify efficiency improvements and opportunities to reduce CO_2 emissions from manufacturing processes. Incentive programs could be offered to retrofit inefficient processes and equipment and to help offset the additional costs of premium efficiency equipment in new construction.

Program Description

1. Mechanism (i.e., how the policy or program achieves the desired result): CO_2e reductions would be a direct result of the efficiency improvements brought about by these programs. Energy audits would determine the potential savings and CO_2e reductions associated with the efficiency improvements, and financial incentives would help bring about the replacement of inefficient processes and equipment as well as the selection of premium efficiency equipment for new construction.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* While new legislation is in place that has the potential to significantly increase funding (see Section 2.b below), administrative procedures which will guide the use and accountability for these funds must be developed (e.g. Sustainable Energy Division under the NH Public Utilities Commission, Energy Efficiency and Sustainable Energy Board).
    b. *Resources Required:*
        i. Funding – Sources may include the System Benefits Charge, RGGI (Regional Greenhouse Gas Initiative), RPS (Renewable Portfolio Standard), Forward Capacity Market (payments from the New England grid operator, ISO-NE, for reductions in electrical demand), SB 451 (legislation with the potential to spur investment in distributed generation)
        ii. Organizations – Public Utilities Commission, Department of Environmental Services, Energy Efficiency and Sustainable Energy Board, electric and gas utilities, Energy Service Companies
    c. *Barriers to Address (especially for medium to low feasibility actions):*
        i. Funding – This issue is two-fold. Not only must there be funding for programs and incentives, but the businesses and municipalities must also have allocated the funds needed to pay for the project(s). Most often the business funding makes up the majority of the project funding and generally must compete with all other capital projects in the organization for the limited capital funds available. The design of the incentives must take this into consideration – paybacks for efficiency projects must be competitive with other projects being considered by the organization or they will not be implemented.
        ii. Higher First Cost – Premium efficiency equipment generally commands a higher first cost.
        iii. Lack of Information/Unfamiliar Technologies/Product Availability – A problem attendant to all new technologies is an information and experience gap as compared to the comparable "tried and true" product equivalent. This can lead to reluctance on the part of designers, builders, and end-users to adopt the high efficiency alternatives. Furthermore, there can be problems with product availability and lead times.

iv. Owner vs. Occupant Issues – Facility owners who do not pay the operating expenses may be reluctant to install premium efficiency equipment. Similarly, occupants who do not own a facility will be reluctant to make capital upgrades in order to achieve efficiency improvements.

v. Infrastructure – If funding is significantly ramped up, there may be an issue with having sufficient numbers of trained staff in place to implement the increased demand for projects.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* Energy Efficiency and Sustainable Energy Board, Utilities, Energy Service Companies, Department of Resources and Economic Development

   b. *Parties Paying for Implementation:* Rate payers

   c. *Parties Benefiting from Implementation:* Affected facilities, the public

4. Related Existing Policies and Programs: The CORE Programs offered by the electric utilities currently provide these services for electric measures and the gas utilities have comparable programs for natural gas measures.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing* – CORE programs funded by System Benefits Charge; efficiency programs offered by the natural gas utilities.

   b. *Proposed* –
   RCI Action 1.1 - Maximize Energy Efficiency In New Construction
   RCI Action 1.3 - Maximize Energy Efficiency In Existing Commercial, Industrial, and Municipal Buildings
   EGU Action 1.3, Combined Heat & Power Resource Standard

6. Timeframe for Implementation: Efficiency improvements in the electric and natural gas arenas are on-going through programs offered by the utilities. Expanded programs and funding are not likely to be available until 2009.

7. Anticipated Timeframe of Outcome: Immediate benefits with ongoing cumulative savings in energy and CO_2 emissions reductions.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

   a. Costs:

      a. Implementation Cost: Moderate
      b. Timing: Immediate / higher upfront
      c. Impacts: State government

   b. Savings:

      a. Potential Economic Benefit: Supporting Mechanism
      b. Timing:
      c. Impacts: Business – Evenly distributed

3. Other Benefits/Impacts:

   a. Environmental: this would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would

lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

b. Health: Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

c. Social: none known

d. Other: encourages manufacturers and suppliers to build higher quality, energy efficient equipment.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities): This action has moderate potential for implementation.

   a. Technical: limited number of trained auditors but may be supplemented by revolving loan fund and expansion of Smart Start.

   b. Economic: currently limited funding but may be supplemented by revolving loan fund and expansion of Smart Start

   c. Statutory/Regulatory: unknown

   d. Social: none known

5. Other Factors of Note:

6. Level of Group Interest: High

7. References:

   Related CORE Program Brochures:

   - New Construction And Equipment, http://www.psnh.com/SharePDFs/NewConstructionProgramBrochure.pdf
   - Large Business Retrofit, http://www.psnh.com/SharePDFs/LargeBusinessEnergySolutionsBrochure.pdf
   - Small Business Retrofit, http://www.psnh.com/SharePDFs/SmallBusinessEnergySolutionsProgramBrochure.pdf

RCI Action 2.3 – Require Annual CO_2 Emissions Reporting

Summary

Large commercial and industrial facilities should be required to report their calculated annual CO_2 emissions in an effort to promote awareness of greenhouse gas emissions. Because many facilities are already required to inventory and report other pollutants to NHDES on an annual basis, CO_2 emissions reporting could easily be added to the existing reporting structure. A facility would be able to use approved emission factors and annual fuel usage to calculate its emissions. Annual CO_2 emissions reporting would apply to any facility that is required to file annual emissions reports as a condition of a federal or state air permit in New Hampshire.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Commercial and industrial facilities would include annual CO_2 emissions in their annual emissions reports to NHDES. A facility could use gross fuel usage and approved emission factors to calculate its annual CO_2 emissions. The proposed action would apply to any stationary source that is required to have an air permit under NH Code of Administrative Rules Env-A 600 *Statewide Permit System*. The current system for calculation and payment of annual emission fees would be unchanged, and no fees for CO_2 emissions are proposed at this time. Although not part of the proposed action, annual CO_2 emissions reporting might be extended at a future date to include any facility whose annual fossil fuel usage exceeded a set minimum. A program to implement the new CO_2 emissions reporting requirements would need to be developed.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* Administrative rule change
    b. *Resources Required:* NHDES staff
    c. *Barriers to Address (especially for medium to low feasibility actions):* Passage of rule change, push back from affected sources, training for sources newly subject to reporting.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
    a. *Parties Responsible for Implementation:* NHDES
    b. *Parties Paying for Implementation:* Facilities, NHDES
    c. *Parties Benefiting from Implementation:* NHDES, the public

4. Related Existing Policies and Programs: NHDES Annual Emissions Reporting Program for permitted stationary sources. (See NH Administrative Rules, Env-A 907.01 General Reporting Requirements)

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
    a. *Existing*
    b. *Proposed*

6. Timeframe for Implementation: For the industrial sector, the program to include CO_2 in annual emissions reporting could be implemented in 6 months to 1 year based on rule change requirements by NHDES. The commercial sector could take longer than one year because most sources are not currently subject to air emissions reporting.

7. Anticipated Timeframe of Outcome: Because the proposed action would increase awareness of CO_2 emissions in the industrial and commercial sectors, it is hoped that this action would act as a catalyst for proactive reductions in CO_2 emissions by the affected facilities.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Low
        ii. Timing: Constant / even
        iii. Impacts: Business – evenly distributed

    b. Savings:

        i. Potential Economic Benefit: Supporting mechanism only
        ii. Timing:
        iii. Impacts:

3. Other Benefits/Impacts:

    a. *Environmental*: Increased awareness of emissions, reduced energy use would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health*: This action will lead to lower emissions of all pollutants from power generation and reducing those pollutants will reduce their corresponding impact on air quality and human health. Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

    c. *Social*: The measure will add transparency and hold facilities accountable for their own emissions.

    d. *Other*:

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities): This action has a high potential for implementation.

    a. *Technical*: The technical resources and expertise required to implement this action already exist.

    b. *Economic*: Additional state funding may be required to increase staff required to oversee the process.

    c. *Statutory/Regulatory*: An administrative rule would need to be drafted and passed

    d. *Social*: Response to this action item by the public is expected to be positive.

5. Other Factors of Note:

6. Level of Group Interest: Medium

7. References: None

RCI Action 2.4 – Develop Best-Practice Guidelines for Energy-Efficient Process Equipment

Summary

Industry groups in New Hampshire should be encouraged to work together with utilities and environmental professionals to develop industry-specific best practices. These guidelines could include efficiency standards for industry-specific process equipment to aid in purchasing the most energy-efficient equipment. In addition, efficient operating procedures could be documented and distributed across industries. Smaller operations would benefit from shared information on best practices as they do not always have the resources to explore energy efficiency measures on their own.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Current trade groups or industry sectors could be targeted by state government to develop (or improve on current versions of) best practices. Assistance in developing best practices could be provided by the utilities, the NH Department of Environmental Services, and other public and/or private entities. Best practices would then be shared with all members of the respective industries. Best practices should target process equipment design and operational efficiency. A potential source of funding for this program could be the Greenhouse Gas Reduction Fund (RSA 125-O:23).

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order):* Outreach effort, printed materials targeted toward industry sectors.
    b. *Resources Required:* Utility and government staff. Potential funding source: Greenhouse Gas Reduction Fund (RSA 125-O:23)
    c. *Barriers to Address (especially for medium to low feasibility actions):* None known.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
    a. *Parties Responsible for Implementation:* Industry, utilities, state government.
    b. *Parties Paying for Implementation:* State government/utilities, business sector.
    c. *Parties Benefiting from Implementation:* Industry.

4. Related Existing Policies and Programs: CORE programs funded by Systems Benefits Charge.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
    a. *Existing:* TBD
    b. *Proposed:* RCI Actions 1.3, Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings; 2.1, Create Incentive Programs to Install Higher-Efficiency Equipment, Processes, and Systems; and 2.5, Promote Net-Zero or Minimal-Emissions Industrial and Commercial Clusters

6. Timeframe for Implementation: Promotion of this action could begin immediately.

7. Anticipated Timeframe of Outcome: 2010 and later, as information is disseminated.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects
    a. Costs:

i. Implementation Cost: Low
ii. Timing: Constant / even
iii. Impacts: Business – evenly distributed

b. Savings:

i. Potential Economic Benefit: Supporting mechanism only
ii. Timing:
iii. Impacts:

3. Other Benefits/Impacts:

a. *Environmental*: Increased awareness of emissions, reduced energy use would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

b. *Health*: This action will lead to lower emissions of all pollutants from power generation and reducing those pollutants will reduce their corresponding impact on air quality and human health. Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

c. Social: Promote camaraderie within industry sectors and enable innovation through collaboration.

d. Other:

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):* This action has a high potential for implementation.

a. Technical: The technical resources and expertise required to implement this action already exist.

b. Economic: A small amount of money would be required to promote this program, but legwork would be done by existing groups and existing staff members within state government and the utilities.

c. Statutory/Regulatory: This would not be a regulated/statutory program.

d. Social: The action is anticipated to have high public support due to its low cost.

5. Other Factors of Note:

6. Level of Group Interest: Medium

7. References: None

RCI Action 2.5 – Promote Net-Zero or Minimal-Emissions Industrial and Commercial Clusters

Summary

Commercial and industrial facilities utilize over 20 percent of energy consumed in New Hampshire. A program could be instituted to promote overall energy efficiency in commercial and industrial clusters – primarily in new construction and secondarily in existing entities – by optimizing complementary uses, activities, and shared facilities such as cogeneration, waste heat utilization, and district heating and cooling. The ideal installations would emit no net CO_2, but those that utilize state-of-the-art energy minimization strategies would substantially reduce greenhouse gas emissions in any case. To augment this program, industry groups, DES, DRED, and OEP would provide a matrix indicating projected energy and cost savings based on utilizing up-to-date energy conservation technologies and state of the art energy sources (bio-mass, solar, wind, CHP and co-generation). These organizations also might help in "match-making" complementary business activities, e.g., a greenhouse operation that could utilize waste heat from a wood-fired electric power plant.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   Step 1. Develop a series of "beta" sites, either industrial or commercial, that would incorporate to the maximum practical extent:

   - Renewable energy resources,
   - Energy conservation measures, and
   - Complementary business activities and energy usage profiles.

   The resulting measures and energy and savings would be made available to interested parties and promoted by the appropriate entities. (A beta site is an actual operating facility that utilizes the technologies and practices that are being promoted.)

   Step 2. Promote widespread use of the practices developed at the "beta" sites.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

   a. *Method of Establishment (e.g., legislation, executive order):* Outreach effort to locate firms which would act as "beta" sites. Match-making and model zoning and planning provisions.

   b. *Resources Required:* Industry groups, DES, DRED, OEP, utilities, energy source suppliers, equipment suppliers.

   c. *Barriers to Address (especially for medium to low feasibility actions):* Incentives to prospective "beta" sites. Potential zoning and siting barriers.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* DRED, DES, OEP

   b. *Parties Paying for Implementation:* DRED, DES, OEP, commercial and industrial facilities. Some components may qualify for funding through statewide energy efficiency programs or RGGI (Regional Greenhouse Gas Initiative)

   c. *Parties Benefiting from Implementation:* Commercial and industrial facilities, the public

4. Related Existing Policies and Programs: None known, other than general smart growth principles as they relate to industrial parks and commercial centers.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing:* Utility energy efficiency programs and various business and economic development efforts.

   b. *Proposed:*

ADP Action 6 – Strengthen the Adaptability of New Hampshire's Economy to Climate Change
AFW Action 2.2.1 – Maintain Infrastructure for Biomass Production and Support Regulatory and Business Efficiencies
AFW Action 2.2.2 – Ensure Biomass Consumption is within Sustainable Limits
AFW Action 2.2.3 – Ensure the Most Efficient Use of Energy/Biomass Stock
EGU Action 1.1 – Revenue Decoupling
EGU Action 1.2 – Energy Efficiency Procurement
EGU Action 1.3 – Combined Heat & Power Resource Standard
EGU Action 2.1 – Renewable Portfolio Standard (RPS)
RCI Action 1.1 – Maximize Energy Efficiency in New Construction
RCI Action 2.1 – Create Incentive Programs to Install Higher-Efficiency Equipment, Processes, and Systems
RCI Action 3.1 – Promote Renewable Energy and Low-CO_2e Thermal Energy Systems
TLU Actions 2.C.1 through 2.C. 8.

6. Timeframe for Implementation: One year, ongoing.

7. Anticipated Timeframe of Outcome: 2010 and thereafter as infrastructure is completed.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

   a. Costs:

      i. Implementation Cost: Moderately Low
      ii. Timing: Immediate / higher upfront
      iii. Impacted: State government

   b. Savings:

      i. Potential Economic Benefit: Supporting mechanism only
      ii. Timing:
      iii. Impacts:

3. Other Benefits/Impacts:

   a. *Environmental*: Increased awareness of emissions, reduced energy use would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

   b. *Health*: This action will lead to lower emissions of all pollutants from power generation and reducing those pollutants will reduce their corresponding impact on air quality and human health. Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

   c. *Social*: Promote camaraderie within commercial and industrial sectors and enable innovation through collaboration.

   d. *Other*: None known.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities): This action has a moderate potential for implementation.

   a. *Technical*: The technical resources and expertise required to implement this action will need to be developed.

b. *Economic*: The initial construction costs may be high but mid- long-terms saving may offset the first costs.

c. *Statutory/Regulatory*: To enable incentives to promote this program, a method for doing so would need to be established.

d. *Social*: The action is anticipated to have public support because of its positive impact on communities.

5. Other Factors of Note:

6. Level of Group Interest: Medium

7. References: None

RCI Action 3.1 – Promote Renewable Energy and Low-CO_2e Thermal Energy Systems

Summary

The state should institute an incentive program to promote the expanded use of renewable and low-CO_2-emissions thermal energy systems to reduce fossil fuel use and GHG emissions from thermal energy use. In New Hampshire, the energy used for space heating, hot water, and process conditioning makes up approximately one-third of total energy consumption. The proposed program would provide incentives and attractive financing for the use of cost-effective, renewable energy resources and high-efficiency/low-CO_2e systems to change the temperature of conditioned space, water, air or other materials for useful purposes. The incentive levels and financing should be directly correlated to the efficiency or conservation levels of the end use. Other criteria to consider include the cost-effectiveness of new systems and the potential value of market transformation and peak demand reduction arising from incentives for particular new systems.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* The program would provide incentives and attractive financing for the use of cost-effective, renewable energy resources and high-efficiency/low-CO_2e systems to meet thermal energy demand. The incentive levels and financing should be based on expected efficiency gains, cost-effectiveness, and other criteria to be developed.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

    a. *Method of Establishment (e.g., legislation, executive order):* There are number of potential existing and new funding options, including:

        i. The Renewable Energy Fund supported by alternative compliance payments (ACPs) under the Renewable Energy Portfolio Standard established pursuant to RSA 362-F:10, which is expected to have funds available starting in July, 2009. This fund is to be used by the PUC "to support thermal and electrical renewable initiatives." HB 1628 (currently pending before the Governor) establishes a $3/watt incentive program for certain residential renewable electric generation systems and authorizes the PUC to establish additional incentives for certain renewable energy systems, all to be funded from the Renewable Energy Fund.

        ii. Existing electric and natural gas utility programs funded by the System Benefit Charge (SBC) for solar hot water or high-efficiency/low-CO_2e thermal energy systems that reduce electric or gas consumption.

        iii. Forward capacity market (FCM) payments, which could be used to help fund renewable programs that directly reduce future electric system peak capacity demands.

        iv. SB 451, (currently pending before the Governor), which would create the possibility of direct utility investment in distributed energy resources under certain circumstances.

        v. The GHG Emissions Reduction Fund under RSA 125-O:23, which can be used for programs that increase the electrical and thermal energy efficiency of buildings, including such measures as "integration of passive solar heating and ventilation systems," among other things.

        vi. Additional projects that reduce or avoid CO_2 emissions from natural gas, oil, or propane end-use combustion due to end-use energy efficiency (including high efficiency equipment and renewable systems). These are projects that would qualify for CO_2 emissions offsets under the Regional Greenhouse Gas Initiative, which could create a revenue source up to the market value of CO_2 emission allowances.

        vii. Loan Programs such as Ocean National Bank, USDA Rural Development, Energy Efficient mortgages, and other revolving loan funds, which could help in financing projects based on pay-back from savings.

        viii. Federal tax credits, to the extent available.

ix. A possible Thermal Energy System Benefit Charge (TSBC), which could be levied on fuel oils, kerosene, propane, natural gas, and coal used for heating. Such a levy would be based on the carbon output per delivered energy unit, e.g., the tons CO_2e per million Btu. The proceeds would be deposited in a fund to be administered by a statewide authority. The TSBC would have to be implemented through legislative action. Corollaries exist in the language creating the Oil Discharge and Cleanup Fund and related statutes. (RSA 146-D through F).

b. *Resources Required*: For a Thermal Energy System Benefit Charge:

i. Data collection methodology for the fuels not currently subject to statutory regulation.

ii. Methodology for determining the relative renewable component of any energy source on a life-cycle basis.

iii. Administrative entity. It would be preferable to combine any TSBC or other new fund with an existing or future entity delivering energy efficiency and/or renewable energy services statewide

c. *Barriers to Address (especially for medium to low feasibility actions):*

i. Lost sales in the fossil fuel industry.

ii. Lack of infrastructure and investment to transition from fossil fuel sources to renewable fuel sources, such as bulk wood pellet distribution systems.

iii. Potential property tax impacts to owners arising from installation of capital-intensive renewable energy systems (or other high efficiency/low emission systems such as ground source heat pumps) that replace fossil fuel use that is not subject to the property tax, with regard to any state-wide property tax and with regard to local property taxes in communities that have not exercised the local option to exempt solar, wind, and/or wood heating systems pursuant to RSA 72:27-a and RSA 72:61-72.

iv. Short term incremental capital costs that may exceed short term savings.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

a. *Parties Responsible for Implementation:* PUC, OEP, and other possible statewide organizations, the fossil fuel industry for a TSBC fund collection.

b. *Parties Paying for Implementation:* With regard to utility programs, RPS and RGGI funds: utility and especially electric utility ratepayers. With regard to a possible TSBC, the users of fossil fuel excluding those for electric generation and/or transportation use.

c. *Parties Benefiting from Implementation:* All users of thermal energy, producers of thermal energy systems and resources.

4. Related Existing Policies and Programs: Electric and gas utility energy efficiency programs and the weatherization program. The OEP is leading a Thermal Energy Study Group and is due to make a report and recommendations on certain issues concerning thermal renewable energy by November 1, 2008, pursuant to 2007, 26:6.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

a. *Existing:* The renewable energy portfolio standard (RPS), the Regional Greenhouse Gas Initiative (RGGI), and the Governor's 25 x '25 initiative for the state to get 25 percent of its energy needs from renewable energy by 2025.

b. *Proposed:* The Energy Efficiency and Sustainable Energy Board proposed under HB 1561, currently pending before the Governor, which would, among other things, be responsible for developing "a plan for economic and environmental sustainability of the state's energy system including the development of high efficiency clean energy resources that are either renewable or have low net greenhouse gas emissions."

6. Timeframe for Implementation: Rules have been adopted by the PUC for the Renewable Energy Fund and initial funding is anticipated by July 2009. Rules need to be developed and adopted for use of the GHG Emissions Reduction Fund, which could have some funding by early 2009. The estimated time to draft and pass legislation authorizing a TSBC is about 2 years.

7. Anticipated Timeframe of Outcome: Programs could start to ramp up to scale beginning in 2009 and continue for a number of subsequent years until maximum penetration of thermal renewable systems is achieved.

Program Evaluation

1. Estimated CO_2 Emission Reductions

    a. Short-term (2012): 0.03 MMTCO2e/year
    b. Mid-term (2025): 0.13 MMTCO2e/year
    c. Long-term (2050): 0.24 MMTCO2e/year

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderate
        ii. Timing: Immediate / higher initial costs
        iii. Impacts: Consumer – evenly distributed

    b. Savings:

        i. Potential Economic Benefit: Moderate
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Consumer – evenly distributed

3. Other Benefits/Impacts:

    a. *Environmental:* This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

    c. *Social*: Energy efficiency and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state

    d. *Other*: This program will have broad and deep economic development impacts, including reduction of cash outflows for fossil fuel imports and promotion of conservation of a valuable and finite natural resource.

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):*

    a. *Technical*: The technologies exist, are advancing, and are increasingly available.

    b. *Economic*: Return will lag investment by 1 to 2 years or more initially. Some renewable and high efficiency thermal systems may have long payback periods.

    c. *Statutory/Regulatory*: Legislation is necessary for implementing a TSBC.

d. *Social*: Rising and volatile fossil fuels prices are greatly increasing public interest and support for high efficiency and renewable thermal systems. For adoption of a TSBC the greatest challenges to address may be fossil fuel industry and consumer resistance to a mandated cost and developing an incentive mechanism for the fossil fuel supply industry.

5. Other Factors of Note:
    a. Program goals should be explicit, long term, aggressive, and durable.
    b. Programs should be tied to an aggressive thermal mandate.
    c. Programs should be offered in coordination with comprehensive efficiency and conservation measures.
    d. This program may include incentives for fossil fuel-fired combined heat and power and district energy systems, but should have a preference for renewable fuel systems.

6. Level of Group Interest: High

7. References:

RCI Action 4.1 – Include Energy Efficiency and Conservation in School Curriculum

Summary

The existing K-12 school curriculum standards should be enhanced to promote the development of a citizenry that has a comprehensive understanding of the complex issues of climate change and the opportunities to engage in energy efficiency and conservation measures. Greenhouse gas emission reductions would be achieved as the students carry their growing knowledge of sustainable behavior back to their families and communities. Sustainable behaviors can happen as part of daily habits, life-long decisions, individual advocacy, and community involvement.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Short-term and long-term goals would be developed for education of New Hampshire's K-12 students on the subject of climate change and energy efficiency from a multi-disciplinary perspective, including topics in science, mathematics, and social studies. Goal development would be achieved through joint efforts of educators and experts on the environmental issues.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment (e.g., legislation, executive order)*
        i. The short-term goal of this program would be to create partnerships between New Hampshire educators, energy efficiency, and environmental experts to establish a series of educator workshops to train New Hampshire teachers in the nuances of climate change education and the available energy efficiency and conservation methods that lead to environmental benefits including reductions in greenhouse gas emissions. These workshops would initially target those teachers in the participating school districts that routinely serve as "teacher leaders" and frequently drive curriculum development. By exploring classroom integration through their own curricula, these innovators would establish the pathways through which energy efficiency and conservation curriculum could be implemented district-wide. Continuing support would be offered to the teachers that completed the workshops for greater success in integration into the districts' curriculum requirements.
        ii. The long-term goal of this program would be to amend the New Hampshire Curriculum Frameworks in all age categories to address specifically these goals with particular emphasis on curriculum for grades 9 to 12, including both open enrollment and advanced curricula. Such amendments are expected to require revisions to the focus of existing curriculum framework criteria, as well as increased specificity in science and social studies curriculum framework criteria.

    b. *Resources Required*
        i. Partnership development would be required and specific educator training workshops would need to be developed. Workshop topics/materials could be obtained from existing energy efficiency and conservation educator programs (such as those developed in Maine, etc.) The focus of these efforts would be on collaborative-teaming, rather than the creation of specific lessons. Targeted teacher leadership development on issues pertaining to climate change and energy efficiency would begin in a specific number of school districts per year. In addition, continued professional development and support would be offered to teachers who completed the workshops.
        ii. Opportunities and resources are to be made available in every NH school system for extracurricular activities that engage students to actively learn about climate change and energy efficiency issues, to develop skills required to meet challenges related to these issues (including life skills as well as skills needed by green business), and to affect positive behavioral changes. Programs are to be developed to challenge students and encourage competition between schools in greenhouse gas reduction initiatives by students and their families and communities. Support

and leadership by teachers, parents, green businesses, and advocacy groups for programs at the school level (i.e., mentors and coaches) are to be sought. Training and educational materials for these supporters and leaders is to be developed and made readily available.

c. *Barriers to Address (especially for medium to low feasibility actions):* See Potential for implementation for an in depth review.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
   a. *Parties Responsible for Implementation:* New Hampshire Department of Environmental Services, The Energy Efficiency and Sustainable Energy Board to be established by the Regional Greenhouse Gas Initiative, NH Board of Education, and NH school systems.
   b. *Parties Paying for Implementation:* TBD
   c. *Parties Benefiting from Implementation:* All NH students in K-12, and their families and communities

4. Related Existing Policies and Programs: TBD

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*
   a. *Existing:* TBD
   b. *Proposed:* TBD

6. Timeframe for Implementation: The development of multi-disciplinary teaching modules/workshops for educators should be achieved as soon as feasible (suggested target date of June 2010). Training in targeted communities/school districts would begin thereafter, continuing each year in different communities. Amendments of the New Hampshire Curriculum Frameworks and new teacher certification requirements would be a longer-term goal (suggested target date of June 2020). Conformance with new continuing education requirements is expected to require at least one additional year. Focus disciplines are expected to include science, social studies, and mathematics.

7. Anticipated Timeframe of Outcome: Mid- to long-term as the impacts of education will be realized throughout an individual's lifetime.

<u>Program Evaluation</u>

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects
   a. Costs:
      i. Implementation Cost: Low
      ii. Timing: Constant / Even
      iii. Impacts:
   b. Savings:
      i. Potential Economic Benefit: Supporting mechanism only
      ii. Timing:
      iii. Impacts:

3. Other Benefits/Impacts:
   a. *Environmental:* In the longer term, this would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

c. *Social*: Increased awareness and implementation of energy saving and sustainable generation efforts through public participation and education will alleviate climate change. However, methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

a. *Other*: Secondary benefits include behavioral changes that improve environmental conditions in numerous areas (e.g., solid and hazardous waste reduction, reduced sprawl), inspiration of future generation in development of alternative energy sources and technologies, preparation of future generation for participation and leadership in a wide variety of green businesses, and increased awareness in environmental impacts on health.

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):*

a. *Technical*: The technical resources required already exist. Staff resources and materials will need to be addressed.

b. *Economic*:

c. *Statutory/Regulatory*:

d. *Social*:

Existing curriculum frameworks provide a basis for future amendments. School curricula must meet federal requirements. Local educational resources and school day time allotments are restrictive. As such, curriculum amendments need to be comprehensive to address the complexity of climate change and energy efficiency issues, and, at the same time, to accommodate federal requirements and New Hampshire curriculum goals in all subjects without imposing unrealistic demands on resources and school day time allotments.

The New Hampshire Curriculum Frameworks are regularly reviewed and amended, and can be similarly reviewed and amended given new education goals pertaining to global warming and climate change.

A number of schools in New Hampshire have implemented multi-disciplinary programs on environmental issues. The educators responsible for these programs are a valuable resource for the development of new materials to meet new educational goals and curriculum amendments. Development of these new materials would require funding at a state level.

Teachers in focus disciplines may be reluctant to take part in continued development on issues that may, at first, appear to them to be unrelated to their subject area. Teachers of subjects that are not included in the focus disciplines are likely to resist what appears to them to be a reduction in focus in their study areas. As such, development of teachers in all subjects is necessary for the success of this program. All teachers would need to have a broad, generalized understanding of the issues of climate change and energy efficiency, and be given the opportunity to learn how these issues affect them and their students.

Multi-disciplinary programs require more communication and planning among teachers. Teachers in focus disciplines would need common planning periods. This need could pose a significant challenge to educational administrators. Employment of additional teachers would be necessary in some schools to enable scheduling common planning periods.

Limited programs and resources are currently available within New Hampshire schools for advanced study and extracurricular activities that engage students in climate change and energy efficiency issues. Existing programs and resources could be expanded, and new programs should be developed and implemented. Expanded and new programming would require resources not currently available.

Recruitment and training of educators, parents, and other volunteer entities (e.g. Scouting, green businesses, global warming advocacy groups) would be needed.

5. Other Factors of Note: TBD

6. Level of Group Interest: High

7. References:

RCI Action 4.2 – Increase Energy Efficiency through Building Management Education Programs

Summary

The State of New Hampshire, energy utilities, and energy companies (such as oil and propane distributors) should continue and expand energy efficiency education for building maintenance and energy management staff. The industrial, small business, and government sectors should make use of the many training opportunities provided by utilities and private consulting firms to help with the identification of and continual improvement of building management best practices. Training should focus on energy audits as a proven method for identifying energy efficiency opportunities to minimize or eliminate net CO_2e output in existing buildings, while "beyond code" certification would assure that new buildings create the lowest possible environmental impact.

In addition, the state and its business organizations should promote the creation of building manager positions within companies and government agencies still without these positions. Furthermore, the concept of placing one person in charge of energy efficiency within an organization should be introduced to small businesses. This action would encourage regular reviews of energy use and identification and implementation of savings opportunities. Organizations should provide their energy managers with the responsibility and the budgetary tools necessary to implement energy saving measures and preventative maintenance programs that would reduce fossil fuel consumption and harmful emissions. These managers should have the ability to seek out grants and shared savings programs to reduce energy use and emissions.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

    a. Training: Improved knowledge of energy savings strategies would help reduce energy usage and/or displace existing energy resources with high-efficiency equipment and/or renewable fuels. To the extent economically feasible, program elements might include:

        i. Existing Buildings:

            - Building operations management / commercial energy auditing*
            - Operations and maintenance best practices*
            - Retro-commissioning of buildings and equipment
            - Energy audit training*
            - US EPA benchmarking
            - US EPA / US DOE Energy Star certification*
            - Certified Energy Management (CEM) course*
            - Mass-marketing campaign

            *currently provided by electric and gas utilities, certain technical colleges, and/or the PUC

        ii. New Construction:

            - Energy code training*
            - Beyond code training*
            - Beyond code audits / assistance*
            - High-performance building practices* (Energy Star, LEED, New Buildings Institute, etc.)
            - Commissioning of buildings (new and existing) and equipment
            - US EPA benchmarking
            - US EPA / US DOE Energy Star certification*
            - Mass-marketing campaign

            *currently provided by electric utilities and the PUC

    b. Energy Managers: The state (perhaps the Office of Energy and Planning, the Department of Environmental Services, or the Public Utilities Commission), acting either directly or in conjunction with the energy utilities, should conduct a program to promote the creation of building energy manager

positions within companies that have not already done so. Implementation of this program could also draw upon the resources and expertise of the Business and Industry Association and the local Chambers of Commerce. An effective building energy manager is one who can foster a corporate mentality that encourages energy efficiency in all aspects of a company's operations. Building managers can conduct regular reviews and audits of energy use and savings opportunities. They can also seek out grants from utilities and shared savings projects from energy service companies to make energy savings improvements. While the main focus of the program would be on mid-size and larger businesses, attention to energy efficiency would be beneficial to businesses of all sizes. Therefore, the concept of energy management should be introduced into even the smallest operations.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*
    a. *Method of Establishment* (e.g., legislation, executive order): The named agencies should work with the Energy Efficiency and Sustainable Energy Board (formed as a result of HB 1561) to review the funding opportunities and how a program might appropriately fit the organizations' responsibilities.
    b. *Resources Required*: Educational funding might come from the electric & natural gas utility conservation programs that are funded by the Systems Benefit Charge or from government sources. The program could be run through the state's business associations such as the Business and Industry Association or the local Chambers of Commerce.
    c. *Barriers to Address* (especially for medium to low feasibility actions): The most significant barrier to success of such a program might be institutional inertia where the corporate culture generally relegates building maintenance and management to a lower status than would be required to revolutionize the operations of businesses.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*
    a. *Parties Responsible for Implementation*: DES, OEP, and PUC would promote training opportunities and the creation of energy management positions. Currently, the electric CORE utilities conduct a variety of training classes including building manager certification and commercial auditor training for the private sector and government. The natural gas utilities are conducting specialty training on various aspects of energy efficient construction. New Hampshire's Community Colleges (MCC, LRCC) have programs on best building practices with a focus on energy. There are also other non-governmental organizations that have specialized energy efficiency expertise they are willing to share. They include the Community Action Program's Weatherization Offices, the Buildings Code Assistance Program, and many more.
    b. *Parties Paying for Implementation*: These programs are generally funded through Systems Benefit Charges and/or directly through tuition payments.
    c. *Parties Benefiting from Implementation:* Any business operating in New Hampshire, any homeowner or renter in New Hampshire.

4. Related Existing Policies and Program*:* Existing utility-run energy efficiency programs

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):* Proposed RCI Actions 1.1, Maximize Energy Efficiency in New Construction; 1.2, Maximize Energy Efficiency in Existing Residential Buildings; 1.3, Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings; 1.4.a, Upgrade Building Energy Codes; 1.4b, Improve Building Energy code Compliance; 1.5, Establish an Energy Properties Section in MLS Listings; 4.3 Reduce Residential Energy Demand through Education and Outreach; and 4.4, Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program

6. Timeframe of Implementation: TBD. (There are 36,000 commercial or industrial establishments in New Hampshire.)

7. Anticipated Timeframe of Outcome: CO_2e reductions would begin to accrue immediately as each business implements improved practices.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

   a. Costs:

      i. Implementation Cost: Moderately low
      ii. Timing: Immediate / higher initial costs
      iii. Impacts: State government

   b. Savings:

      i. Potential Economic Benefit: Moderately High
      ii. Timing: Low short-term / mostly long-term
      iii. Impacted: Business – evenly distributed

3. Other Benefits: *(non-carbon environmental benefits, etc)*

   a. Environmental*:* This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend. Potential benefits beyond CO_2e reductions include: water savings, reduced sewage

   b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

   c. Social: Additional jobs would be created (e.g., instructors, building energy managers) and cost savings would be realized due to reductions in energy use

   d. Other:

4. Potential for Implementation *(i.e., including challenges, obstacles and opportunities):*

   a. *Technical*: There are no anticipated impediments.

   b. *Economic*: The funding for energy efficiency programs is limited.

   c. *Statutory/Regulatory*: There are no anticipated impediments.

   d. *Social*: There are no anticipated impediments.

5. Other Factors of Note:

   The Community Colleges already provide educational programs such as Building Construction Technology (Manchester) and Energy Services & Technology Program (Lakes Region).

   There are several educational programs in place today available through the NHPUC and the electric and gas utilities, including a Commercial Energy Auditing Class, Certified Energy Manager Program, Operations & Maintenance Best Practices, and Energy Code and Beyond.

6. Level of Group Interest: High

7. References:

RCI Action 4.3 – Reduce Residential Energy Demand through Education and Outreach

Summary

New Hampshire should adopt a community-based educational outreach program aimed at reducing greenhouse gas (GHG) emissions in the residential sector. Residential GHG emissions account for roughly half of all greenhouse gas emissions, when personal vehicles are included; and an organized, concerted effort to engage residents in a voluntary reduction of their household energy consumption would be beneficial. Such a program would provide the information, tools, and support needed to enable households to understand how they use energy and map out a strategy to reduce their energy consumption. Emphasis should be placed on the financial savings achievable through home energy reduction. The program should make use of the various networks and communities of which residents are part (towns, neighborhoods, civic groups, faith-based organizations, businesses etc) since these communities can encourage and support their members in making sustained, socially beneficial changes at the individual household level. To foster change at the household level, research-based behavioral change strategies that target the root causes of climate change inaction should be employed through a comprehensive system of outreach activities that strengthen communities and do not rely solely on information-based campaigns.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):* Emphasize the connection between household energy use, greenhouse gas emissions, and energy costs to encourage households to adopt changes that will reduce their environmental footprint and save them money. Provide the framework and tools for households to quantify their energy-related emissions and develop a strategy to reduce these emissions. Encourage greater participation by promoting the need for good stewardship of the Earth to protect the Earth's climate and resource availability for future generations.

   Use a database to quantify emission reductions, participation rates, and chart progress toward achieving emission reduction goals and objectives. Link individual actions to community-based efforts to reduce emissions and produce a map showing the distribution of communities that are taking action (See Appendix A). Emphasize social aspects of community-based initiatives to inspire friendly competitions among communities, help make the behavior normative ("Our households are saving $800 a year on our energy costs. Join us!") and boost participation rates. Encourage a prominent public display of the community's goal in energy reduction and progress toward reaching that goal.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

   a. *Method of Establishment (e.g., legislation, executive order):*

      The state could adopt the New Hampshire Carbon Challenge (NHCC, http://nhcarbonchallenge.org) as a platform to reduce residential energy consumption and could issue an Executive Order to encourage all state employees to take the challenge and a call to action of NH citizens to do the same. Local energy committees, businesses, schools, faith-based organizations, and community organizations are terrific venues for disseminating the Carbon Challenge.

      The New Hampshire Carbon Challenge is an innovative program that has adapted proven climate change communication techniques and research-based behavioral change strategies, which target the root causes of climate change inaction, to create a unique set of tools that support households and communities in reducing their GHG emissions. These tools emphasize the financial benefits associated with household energy conservation and efficiency and provide the means for households to map out a strategy to reduce their energy consumption and chart their progress toward achieving their goals. The NHCC also employs a comprehensive system of outreach activities which make use of the networks and communities (e.g., towns, neighborhoods, civic groups, faith-based organizations, businesses) since these communities are essential partners in creating sweeping and sustained reductions in energy usage at the household level. Since October 2007, households in New Hampshire that have taken the New Hampshire Carbon Challenge have identified actions they are willing to take in their homes that will reduce their greenhouse gas emissions by an average of 17% and save them $835 a year in energy costs.

b. *Resources Required:* Some financial resources required for statewide implementation of outreach efforts and development of additional web-based tools to enable households to maximize their greenhouse gas reductions.

c. *Barriers to Address (especially for medium to low feasibility actions):* Individual behavioral change is difficult and most campaigns to promote residential energy reduction only distribute information and therefore have limited impact. What's needed is an integrated, collaborative approach that strengthens communities, builds social capital, and gives residents incentives and recognition for making personal changes that yield major societal benefit.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

   a. *Parties Responsible for Implementation:* NH DES and/or NH OEP in partnership with the New Hampshire Carbon Challenge.

   b. *Parties Paying for Implementation:* Current ratepayers

   c. *Parties Benefiting from Implementation:* All citizens of the state

4. Related Existing Policies and Programs:

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

   a. *Existing:* Utility-sponsored efficiency programs funded through the SBC.

   b. *Proposed:* RCI Action 4.1, Include Energy Efficiency and Conservation in School Curriculum; RCI Action 4.2, Maximize Efficiency through Building Management Education Programs; RCI Action 4.5, Create an Energy Efficiency and Sustainable Energy Systems Web Portal

6. Timeframe for Implementation: Immediate and ongoing

7. Anticipated Timeframe of Outcome: 2008 and ongoing

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

   a. Costs:

      i. Implementation Cost: Low
      ii. Timing: Constant / even
      iii. Impacted: State government

   b. Savings:

      i. Potential for Implementation: Supporting mechanism only
      ii. Timing:
      iii. Impacts: Consumer – evenly distributed

3. Other Benefits/Impacts:

   a. *Environmental:* Since half of all greenhouse gas emissions come from the residential sector, when personal vehicles are included, household energy reduction must be a critical component of any strategy to reduce greenhouse gas emissions.

   b. *Health:* The significant rise in extreme heat days (days in which temperatures exceed 90°F or 100°F) projected in this century is likely to increase the risk of heat stress, heat stroke, and heart attacks.

Warmer temperatures also encourage the breeding of disease carriers such as mosquitoes, ticks, and rodents. Curbing emissions is essential to protecting air quality and human health.

c. *Social:* Household use of energy reflects deeply ingrained patterns of behavior, thus a sustained reduction in energy consumption is achievable only by altering these underlying behaviors (such as reducing unnecessary vehicle mileage, eliminating phantom load etc). These changes are difficult to make in isolation and are more likely to succeed if part of a larger community-wide effort. Residential outreach efforts should make use of existing networks and communities which can strengthen these communities and build social capital.

Reducing residential energy consumption also has a direct and immediate impact on reducing energy costs. The typical household in New Hampshire that has taken the New Hampshire Carbon Challenge has identified actions they are willing to take in their home that will reduce their emissions by 17% and save them $835 a year in energy costs.

d. *Other:* Emphasis on buying local to reduce transportation emissions benefits farmers markets and other local initiatives and creates demand for products made in New Hampshire.

Educating residents about energy consumption, climate impacts, and dollars saved is transferable knowledge that can benefit other sectors. For example, understanding the importance of using energy efficient lighting and reducing phantom load can lead to increased awareness of opportunities to conserve energy in businesses, schools and municipalities.

4. Potential for Implementation (i.e., including challenges, obstacles and opportunities):

a. *Technical:* There is an immediate potential for implementing this action as the technology is available and some of the work is already being done.

b. *Economic: Additional funding will be needed to sustain the program and enable the development of the appropriate self-0sustain social networks.*

c. *Statutory/Regulatory:*

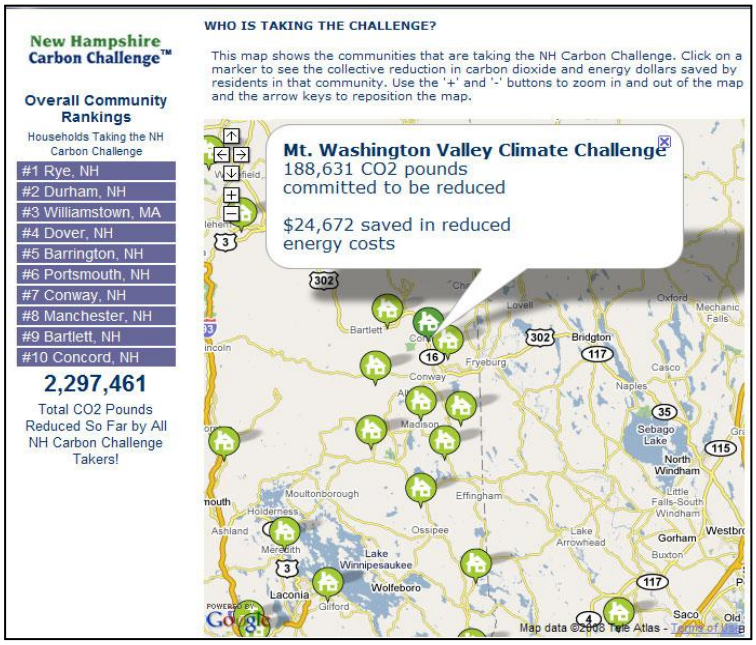
d. *Social*: There has been a positive response to this program and its message due the connection between climate change action, energy conservation and efficiency, and cost savings.

5. Other Factors of Note: No other environmental organization in New Hampshire focuses on the residential sector and has in place a comprehensive program to reduce household greenhouse gas emissions. A well designed residential outreach initiative creates demand for utility sponsored efficiency programs promoting energy efficient products and technologies.

6. Level of Group Interest: High

7. References:

Map of households taking the New Hampshire Carbon Challenge: Using community-based initiatives and friendly competition to galvanize change in the household sector.



RCI Action 4.4 – Establish a Comprehensive Energy Efficiency and Renewable Energy Education Program

Summary

New Hampshire should establish a comprehensive Energy Efficiency and Renewable Energy Education Program serving all segments of building design, construction, sales, and ownership/maintenance. This program would provide accessible resources and educational opportunities to individuals and organizations who design, build, evaluate/rate, maintain, sell, own, and occupy buildings. The program would be established and administered at various settings throughout the state, including demonstration centers, community colleges, training seminars, etc.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   There is a tremendous gap between knowledge and practice. It is estimated that just by using current technology efficiently and correctly we could cut building energy consumption and associated greenhouse gas emissions by 30 percent. In the proposed action, the state of New Hampshire, utility companies, colleges, professional and building trade organizations, etc. would sponsor ongoing training and offer demonstration sites for energy-efficient and renewable energy practices for architects, engineers, and homeowners. The program would provide training and support to builders, code officials, and energy raters, and would establish working groups for building managers and real estate agents.

2. Implementation Plan (*i.e., how to implement the specific policy or program*):

   a. *Method of Establishment (e.g., legislation, executive order):* The proposed action would create partnerships to establish comprehensive education and training programs for all segments of building design, construction, management, and ownership. Experience gained in the CORE Efficiency Programs could prove useful in implementing this action item. The most direct approach has been to offer targeted training seminars on a wide spectrum of energy efficiency topics at locations across the state. These seminars currently reach approximately 1,000 professionals and 10,000 school children each year. In addition, several education partnerships have been established. In one partnership with the Peabody Mills Environmental Center (PMEC), the local utility provided technical advice and incentives for improving the efficiency of the facility, and in return, the PMEC agreed to incorporate energy efficiency into their public education curriculum which they will be offering on an ongoing basis. In another example, the utility established a partnership with the statewide lodging and restaurant association. The association has used its contacts with its membership to conduct industry-specific training seminars and to introduce the members to the available efficiency audits and financial incentives offered through the CORE Programs.

   b. *Resources Required:* A comprehensive energy efficiency and renewable energy education program would require funding for staffing and setting up locations for training seminars. Developing partnerships and building upon existing training programs as described in 2.a above could be an effective way to minimize costs.

   c. *Barriers to Address (especially for medium to low feasibility actions)*

3. Parties Affected by Implementation (*i.e., residents, businesses, municipalities, etc*.):

   a. *Parties Responsible for Implementation:* The NH Department of Environmental Services, other state agencies, the legislature, individual towns, the Lakes Region Community College, other community colleges, and New Hampshire's electric and gas utilities

   b. *Parties Paying for Implementation:* Potential grant funding.

   c. *Parties Benefiting from Implementation:* Builders, contractors, architects, code enforcement officers, building owners, and occupants.

4. Related Existing Policies and Programs: Existing utility-run energy efficiency programs.

5. Complementary Policies (*i.e., those that achieve greater reductions through parallel implementation*):

    a. *Existing:* TBD

    b. *Proposed:* RCI Actions 1.1, Maximize Energy Efficiency in New Construction; 1.2, Maximize Energy Efficiency in Existing Residential Buildings; 1.3, Maximize Energy Efficiency in Existing Commercial, Industrial, and Municipal Buildings; 1.4.a., Upgrade Building Energy Codes; 1.4.b., Improve Building Energy Code Compliance; 1.5, Establish an Energy Properties Section in MLS Listings; 2.5, Promote Net-Zero or Minimal-Emissions Industrial and Commercial Clusters; 4.1, Include Energy Efficiency and Conservation in School Curriculum; 4.2, Increase Energy Efficiency through Building Management Education Programs; and 4.3, Reduce Residential Energy Demand through Education and Outreach

6. Timeframe for Implementation: Immediate and ongoing.

7. Anticipated Timeframe of Outcome: Benefits would accrue from initial educational offerings and would grow exponentially over time.

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Moderately low
        ii. Timing: Immediate / higher upfront
        iii. Impacts: State government

    b. Savings:

        i. Potential Economic Benefit: Moderate
        ii. Timing: Low short-term / mostly long-term
        iii. Impacts: Business – evenly distributed

3. Other Benefits/Impacts:

    a. *Environmental:* This would reduce emissions of carbon dioxide, greenhouse gases, and other primary air pollutants in order to mitigate the effects of climate change and pollution of our ecosystems. This would lead to improved air and water quality directly as well as have more indirect effects on the fish and wildlife and the ecosystems upon which they depend.

    b. *Health:* Human health benefits will be realized by decreasing exposure to toxic and hazardous pollutants, many of which may have an effect that is exacerbated by the increase in hot summer days. Avoiding the impacts of air pollution can reduce the incidence of cardiac and respiratory disease.

    c. *Social*: Increased awareness and implementation of energy saving and sustainable generation efforts through public participation and education will alleviate climate change. However, methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

    d. *Other*: Supporting renewables and conservation lowers the amount of greenhouse gases emitted into the atmosphere, reduces the load on our aging and maximized infrastructure, and creates a demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*):

a. *Technical:* This type of program currently exists at the Lakes Region Community College. Further implementation of this action would involve creating additional partnerships to expand upon the current program.

b. *Economic:*

c. *Statutory/Regulatory:*

d. *Social:*

5. Other Factors of Note: Lakes Region Community College has submitted an NSF grant proposal to establish a comprehensive energy efficiency and renewable energy education center. In addition, there are tremendous resources and opportunities to create partnerships with business and industry.

6. Level of Group Interest: Medium

7. References:

RCI Action 4.5 – Create an Energy Efficiency and Sustainable Energy Systems Web Portal

Summary

The state should develop a searchable, web-based clearinghouse to hasten the adoption of energy efficiency and sustainable energy products and technologies. The portal would serve a range of specific New Hampshire audiences including local energy committees, city and town managers, business owners, industrial and commercial facility managers, and residents. The portal would provide each specific target audience with the resources needed to make informed decisions concerning the available options to reduce their greenhouse gas emissions (e.g., currently available products/services/technologies, costs, projected savings, installers or contractors, online calculators, and tax and/or rebate incentives). Although numerous websites have information of this sort, there is currently no web-based clearinghouse for those who are evaluating purchasing sustainable energy products and technologies or are have decided to buy products or services and need additional information.

Program Description

1. Mechanism *(i.e., how the policy or program achieves the desired result):*

   The state would issue an RFP to create a searchable, web-based clearinghouse for energy efficient products and services. NHDES or NH Office of Energy and Planning would guide the development of this web portal, with assistance and input from organizations that have expertise in energy efficiency in the residential, commercial, and industrial sectors (in particular, the Jordan Institute, New Hampshire Sustainable Energy Association, Residential Energy Performance Association, and New Hampshire Carbon Challenge).

   The portal would include links to related Internet sites and would also house and maintain a local, searchable database. The database would offer flexible search capabilities, allowing users to search on multiple keywords, conduct a free text search, select only those fields in the database of interest to them, or narrow their search in some manner (e.g., "solar electric installers in Merrimack or Hillsborough counties"). To facilitate the growth of this web portal, an on-line form would be developed allowing users to input new records into the database (records would be reviewed prior to being publicly available).

   Potential database fields include:

   - Description of the product/service/technology
   - Cost
   - Projected savings
   - Contact information for distributors and/or installers of the product/service/technology
   - Municipal, state, and federal tax or rebate incentives available
   - Financing options (as banks and other lenders make capital available for sustainable energy projects)
   - A list of local homes, businesses, schools, or municipalities that have purchased the product, are located near the person using the portal, and are willing to be contacted for more information about the product.

2. Implementation Plan *(i.e., how to implement the specific policy or program):*

   a. *Method of Establishment (e.g., legislation, executive order):* The proposed web portal could be added to existing programs and resources supported by state agencies.

   b. *Resources Required:* A coordinator to determine the look and feel of the portal and the structure of the database (relevant fields) and to compile, and maintain (keep current) records in the database. Frequent updating is essential as energy efficiency is a rapidly changing field and new resources are often available. The coordinator will also work closely with the state and partner organizations in developing the web portal as well as the programmer who will create the portal and related web systems.

   c. *Barriers to Address (especially for medium to low feasibility actions):* The portal would need to be heavily advertised (through multiple networks) so that businesses, energy committees, and homeowners would be aware of this resource.

3. Parties Affected by Implementation *(i.e., residents, businesses, municipalities, etc.):*

    a. *Parties Responsible for Implementation:* NHDES or NH Office of Energy and Planning

    b. *Parties Paying for Implementation:* Funding could be derived in part from existing and proposed energy efficiency and renewable funding mechanisms.

    c. *Parties Benefiting from Implementation:* All NH residents and business owners.

4. Related Existing Policies and Programs:

    The New Hampshire Sustainable Energy Association (http://www.nhsea.org), Residential Energy Performance Association (http://www.repa-nh.org), and the American Council for an Energy Efficient Economy (http://www.aceee.org/), among others, include information resources regarding energy efficiency on their websites.

    The New Hampshire Sustainable Energy Association's Consumer Guide (http://www.nhsea.org/resources.php) is an excellent resource for locating companies and organizations that offer sustainable energy products and services in New Hampshire.

    Google.org is a potential resource for finding examples of existing broad-scope websites on energy efficiency and sustainable energy products and technologies.

5. Complementary Policies *(i.e., those that achieve greater reductions through parallel implementation):*

    a. *Existing*

    b. *Proposed:* RCI Action 4.1, Include Energy Efficiency and Conservation in School Curriculum; RCI Action 4.2, Increase Energy Efficiency through Building Management Education Programs; RCI Action 4.3, Reduce Residential Energy Demand through Education and Outreach

6. Timeframe for Implementation: 2008 and ongoing

7. Anticipated Timeframe of Outcome: 2008 and ongoing

Program Evaluation

1. Estimated CO_2 Emission Reductions: This action not individually quantified.

2. Economic Effects

    a. Costs:

        i. Implementation Cost: Low
        ii. Timing: Constant / even
        iii. Impacts: State government

    b. Savings:

        i. Potential Economic Benefit: Supporting mechanism only
        ii. Timing:
        iii. Impacts:

3. Other Benefits/Impacts:

    a. *Environmental*: The web portal is intended to help consumers, businesses, and municipalities reduce their energy consumption. Reducing energy related greenhouse gas emissions is a critical component of any strategy to stabilize our climate.

    b. *Health*: The dramatic rise in extreme heat days (days in which temperatures exceed 90°F or 100°F) projected in this century will likely increase the risk of heat stress, heat stroke, and heart attacks. Warmer

temperatures also encourage the breeding of disease carriers such as mosquitoes, ticks, and rodents. Curbing emissions is critical to protecting air quality and human health.

a. *Social*: Increased awareness and implementation of energy saving and sustainable generation efforts through public participation and education will alleviate climate change. However, methods of reducing energy and alternative generation technologies typically have short-term payback periods and can then provide savings for consumers and economic security for the State in the mid to long-term. By producing energy sustainably and domestically, the economy will benefit through increased jobs within the state.

c. *Other*: Supporting renewables and conservation lowers the amount of greenhouse gases emitted into the atmosphere, reduces the load on our aging and maximized infrastructure, and creates a demand for alternative technologies in the U.S. marketplace.

4. Potential for Implementation (*i.e., including challenges, obstacles and opportunities*):

   a. *Technical*: Developing a web portal on energy efficiency is technically feasible with sufficient web developer and IT personnel resources.

   b. *Economic*: Additional funding may be need for the staff time required to develop and maintain a comprehensive and accurate site.

   c. *Statutory/Regulatory*:

   d. *Social*: There is expected to be a high degree of public support as this information is already desired and requested explicitly.

5. Other Factors of Note:

6. Level of Group Interest: Low - medium

7. References: